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29 CFR Part 1910

Ergonomics Program; Proposed Rule

DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Part 1910

[Docket No. S–777]

RIN No. 1218–AB36

Ergonomics Program

AGENCY: Occupational Safety and Health Administration (OSHA), Department of Labor.

ACTION: Proposed rule; request for comments; scheduling of informal public hearing.

SUMMARY: The Occupational Safety and Health Administration is proposing an ergonomics program standard to address the significant risk of work-related musculoskeletal disorders (MSDs) confronting employees in various jobs in general industry workplaces. General industry employers covered by the standard would be required to establish an ergonomics program containing some or all of the elements typical of successful ergonomics programs: management leadership and employee participation, job hazard analysis and control, hazard information and reporting, training, MSD management, and program evaluation, depending on the types of jobs in their workplace and whether a musculoskeletal disorder covered by the standard has occurred. The proposed standard would require all general industry employers whose employees perform manufacturing or manual handling jobs to implement a basic ergonomics program in those jobs. The basic program includes the following elements: management leadership and employee participation, and hazard information and reporting. If an employee in a manufacturing or manual handling job experiences an OSHA-recordable MSD that is additionally determined by the employer to be covered by the proposed standard, the employer would be required to implement the full ergonomics program for that job and all other jobs in the establishment involving the same physical work activities. The full program includes, in addition to the elements in the basic program, a hazard analysis of the job; the implementation of engineering, work practice, or administrative controls to eliminate or substantially reduce the hazards identified in that job; training the employees in that job and their supervisors; and the provision of MSD management, including, where appropriate, temporary work restrictions and access to a health care provider or other professional if a covered MSD occurs. General industry employers whose employees work in jobs other than manual handling or manufacturing and experience an MSD that is determined by the employer to be covered by the standard would also be required by the proposed rule to implement an ergonomics program for those jobs.

The proposed standard would affect approximately 1.9 million employers and 27.3 million employees in general industry workplaces, and employers in these workplaces would be required in the first year after promulgation of the standard to control approximately 7.7 million jobs with the potential to cause or contribute to covered MSDs. OSHA estimates that the proposed standard would prevent about 3 million work-related MSDs over the next 10 years, have annual benefits of approximately $9.1 billion, and impose annual compliance costs of approximately $900 per covered establishment and annual costs of $150 per problem job fixed.

OSHA is scheduling informal public hearings to provide interested parties the opportunity to orally present information and data related to the proposed rule.

DATES: *Written comments.* Written comments, including materials such as studies and journal articles, must be postmarked by February 1, 2000. If you submit comments by facsimile or electronically through OSHA's internet site, you must transmit those comments by February 1, 2000.

Notice of intention to appear at the informal public hearing. Notices of intention to appear at the informal public hearing must be postmarked by January 24, 2000. If you submit your notice to intention to appear by facsimile or electronically through OSHA's Internet site, you must transmit the notice by January 24, 2000.

Hearing testimony and documentary evidence: If you will be requesting more than 10 minutes for your presentation, or if you will be submitting documentary evidence at the hearing, you must submit the full testimony and all documentary evidence you intend to present at the hearing, postmarked by February 1, 2000.

Informal public hearing. The hearing in Washington, DC, is scheduled to begin at 9:30 a.m., February 22, 2000 at the Frances Perkins Building, U.S. Department of Labor. The hearing in Washington, DC, is scheduled to run for 4 weeks. It will be followed by a hearing March 21–31, 2000, in Portland OR, and April 11–21, 2000, in Chicago, IL. Time and location for the regional hearings will be announced later in the **Federal Register**.

ADDRESSES: *Written comments: Mail:* Submit duplicate copies of written comments to: OSHA Docket Office, Docket No. S–777, U.S. Department of Labor, 200 Constitution Avenue, N.W., Room N–2625, Washington, DC 20210, telephone (202) 693–2350.

Facsimile: If your written comments are 10 pages or less, you may fax them to the Docket Office. The OSHA Docket Office fax number is (202) 693–1648.

Electronic: You may also submit comments electronically through OSHA's Homepage at *www.osha.gov*. Please note that you may not attach materials such as studies or journal articles to your electronic comments. If you wish to include such materials, you must submit them separately in duplicate to the OSHA Docket Office at the address listed above. When submitting such materials to the OSHA Docket Office, you must clearly identify your electronic comments by name, date, and subject, so that we can attach them to your electronic comments.

Notice of intention to appear: Mail: Notices of intention to appear at the informal public hearing may be submitted by mail in quadruplicate to: Ms. Veneta Chatman, OSHA Office of Public Affairs, Docket No. S–777, U.S. Department of Labor, 200 Constitution Avenue, N.W., Room N–3647, Washington, DC 20210, Telephone: (202) 693–2119.

Facsimile: You may fax your notice of intention to appear to Ms. Chatmon at (202) 693–1634.

Electronic: You may also submit your notice of intention to appear electronically through OSHA's Homepage at *www.osha.gov*.

Hearing testimony and documentary evidence: You must submit in quadruplicate your hearing testimony and the documentary evidence you intend to present at the informal public hearing to Ms. Chatmon at the address above. You may also submit your hearing testimony and documentary evidence on disk (3½ inch) in WP 5.1, 6.0, 6.1, 8.0 or ASCII,

provided you also send the original hardcopy at the same time.

Informal public hearing: The informal public hearing to be held in Washington DC will be located in the Frances Perkins Building, U.S. Department of Labor, 200 Constitution Avenue, N.W., Washington, DC 20210. The locations of regional hearings in Portland, OR, and Chicago, IL, will be announced in a later **Federal Register** notice.

FOR FURTHER INFORMATION CONTACT: OSHA's Ergonomics Team at (202) 693–2116, or visit the OSHA Homepage at *www.osha.gov*.

SUPPLEMENTARY INFORMATION:

Table of Contents

The preamble and proposed standard are organized as follows:

References to the rulemaking record are in the text of the preamble. References are given as ''Ex.'' followed by a number to designate the reference in the docket. For example, ''Ex. 26–1'' means exhibit 26–1 in Docket S–777. A list of the exhibits and copies of the exhibit are available in the OSHA Docket Office.

I. Introduction

A. Overview

The preamble to this proposed ergonomics program standard discusses the data and events leading OSHA to propose the standard, the Agency's legal authority for proposing this rule, requests for information on a number of issues, and a section describing the significance of the ergonomic-related risks confronting workers in manufacturing, manual handling, and other general industry jobs. The preamble also contains a summary of the Preliminary Economic and Initial Regulatory Flexibility Analysis, a summary of the responses OSHA has made to the findings and recommendations of the Small Business Regulatory Fairness Enforcement Act Panel convened for this rule, a description of the information collections associated with the standard, and a detailed explanation of the Agency's rationale for proposing each provision of the proposed standard.

B. The Need for an Ergonomics Standard

Work-related musculoskeletal disorders (MSDs) currently account for one-third of all occupational injuries and illnesses reported to the Bureau of Labor Statistics (BLS) by employers every year. These disorders thus constitute the largest job-related injury and illness problem in the United States today. In 1997, employers reported a total of 626,000 lost workday MSDs to the BLS, and these disorders accounted for $1 of every $3 spent for workers' compensation in that year. Employers pay more than $15–$20 billion in workers' compensation costs for these disorders every year, and other expenses associated with MSDs may increase this total to $45–$54 billion a year. Workers with severe MSDs can face permanent disability that prevents them from returning to their jobs or handling simple, everyday tasks like combing their hair, picking up a baby, or pushing a shopping cart.

Thousands of companies have taken action to address and prevent these problems. OSHA estimates that 50 percent of all employees but only 28 percent of all workplaces in general industry are already protected by an ergonomics program, because their employers have voluntarily elected to implement an ergonomics program. (The disparity in these estimates shows that most large companies, who employ the majority of the workforce, already have these programs, and that smaller employers have not yet implemented them.) OSHA believes that the proposed standard is needed to bring this protection to the remaining employees in general industry workplaces who are at significant risk of incurring a work-related musculoskeletal disorder but are currently without ergonomics programs.

C. The Science Supporting the Standard

A substantial body of scientific evidence supports OSHA's effort to provide workers with ergonomic protection (see the Health Effects, Preliminary Risk Assessment, and Significance of Risk sections of this preamble, below). This evidence strongly supports two basic conclusions: (1) There is a positive relationship between work-related musculoskeletal disorders and workplace risk factors, and (2) ergonomics programs and specific ergonomic interventions can reduce these injuries.

For example, the National Research Council/National Academy of Sciences found a clear relationship between musculoskeletal disorders and work and between ergonomic interventions and a decrease in such disorders. According to the Academy, ''Research clearly demonstrates that specific interventions can reduce the reported rate of musculoskeletal disorders for workers who perform high-risk tasks'' (Work-Related Musculoskeletal Disorders: The Research Base, ISBN 0–309–06327–2 (1998)). A scientific review of hundreds of peer-reviewed studies involving workers with MSDs by the National Institute for Occupational Safety and Health (NIOSH) also supports this conclusion.

The evidence, which is comprised of peer-reviewed epidemiological, biomechanical and pathophysiological studies as well as other published evidence, includes:

- More than 2,000 articles on work-related MSDs and workplace risk factors;
- A 1998 study by the National Research Council/ National Academy of Sciences on work-related MSDs;
- A critical review by NIOSH of more than 600 epidemiological studies (1997);
- A 1997 General Accounting Office report of companies with ergonomics programs; and
- Hundreds of published ''success stories'' from companies with ergonomics programs;

Taken together, this evidence indicates that:

- High levels of exposure to ergonomic risk factors on the job lead to an increased incidence of work-related MSDs;

- Reducing these exposures reduces the incidence and severity of work-related MSDs;
- Work-related MSDs are preventable; and
- Ergonomics programs have demonstrated effectiveness in reducing risk, decreasing exposure and protecting workers against work-related MSDs.

As with any scientific field, research in ergonomics is ongoing. The National Academy of Sciences is undertaking another review of the science in order to expand on its 1998 study. OSHA will examine this and all research results that become available during the rulemaking process, to ensure that the Agency's ergonomics program standard is based on the best available and most current evidence. However, more than enough evidence already exists to proceed with a proposed standard. In the words of the American College of Occupational and Environmental Medicine, the world's largest occupational medical society, ''there is an adequate scientific foundation for OSHA to proceed with a proposal and, therefore, no reason for OSHA to delay the rulemaking process * * *.''

D. Employer Experience Supporting the Standard

Employers with companies of all sizes have had great success in using ergonomics programs as a cost-effective way to prevent or reduce work-related MSDs, keeping workers on the job, and boosting productivity and workplace morale. A recent General Accounting Office (GAO) study of several companies with ergonomics programs found that their programs reduced work-related MSDs and associated costs (GAO/HEHS–97–163). The GAO also found that the programs and controls selected by employers to address ergonomic hazards in the workplace were not necessarily costly or complex. As a result, the GAO recommended that OSHA use a flexible regulatory approach in its ergonomics standard that would enable employers to develop their own effective programs. The standard being proposed today reflects this recommendation and builds on the successful programs that thousands of proactive employers have found successful in dealing with their ergonomic problems.

E. Information OSHA is Providing to Help Employers Address Ergonomic Hazards

Much literature and technical expertise already exists and is available to employers, both through OSHA and a variety of other sources. For example:

- Information is available from OSHA's ergonomics Web page, which can be accessed from OSHA's World Wide Web site at *http://www.osha.gov* by scrolling down and clicking on ''Ergonomics'';
- Many publications, informational materials and training courses are available from OSHA through Regional Offices, OSHA-sponsored educational centers, OSHA's state consultation programs for small businesses, and through the Web page;
- Publications on ergonomics programs are available from NIOSH at 1–800–35–NIOSH. NIOSH is also a ''link'' on the OSHA ergonomics Web page;
- OSHA's state consultation programs will provide free on-site consultation services to employers requesting help in implementing their ergonomics programs; and
- OSHA is developing a series of compliance assistance materials and will make them available before a final ergonomics standard becomes effective.

II. Events Leading to the Proposed Standard

In proposing this standard, OSHA has relied upon its own substantial experience with ergonomics programs, the experience of private firms and insurance companies, and the results of research studies conducted during the last 30 years. Those experiences clearly show that: (1) Ergonomics programs are an effective way to reduce occupational MSDs; (2) ergonomics programs have consistently achieved that objective; (3) OSHA's proposal is consistent with these programs; and (4) the proposal is firmly grounded in the OSH Act and OSHA policies and experience. The primary lesson to be learned is that employers with effective, well-managed ergonomics programs achieve significant reductions in the severity and number of work-related MSDs their employees experience. These programs also generally improve productivity and employee morale and reduce employee turnover and absenteeism (see Section VIII of this preamble and Chapters IV (Benefits) and V (Costs of Compliance) of OSHA's Preliminary Economic Analysis (Ex. 28–1).

OSHA's long experience with ergonomics is apparent from the chronology below. As this table shows, the Agency has been actively involved in ergonomics for more than 20 years.

OSHA Ergonomics Chronology

Early 1980s	OSHA begins discussing ergonomic interventions with labor, trade associations and professional organizations. OSHA issues citations to Hanes Knitwear and Samsonite for ergonomic hazards.
August 1983	The OSHA Training Institute offers its first course in ergonomics.
May 1986	OSHA begins a pilot program to reduce back injuries through review of injury records during inspections and recommendations for job redesign using NIOSH's Work Practices Guide for Manual Lifting.
October 1986	The Agency publishes a Request for Information on approaches to reduce back injuries resulting from manual lifting. (57 FR 34192)
July 1990	OSHA/UAW/Ford corporate-wide settlement agreement commits Ford to reduce ergonomic hazards in 96 percent of its plants through a model ergonomics program.
August 1990	The Agency publishes ''Ergonomics Program Management Guidelines for Meatpacking Plants.''

OSHA Ergonomics Chronology—Continued

Fall 1990	OSHA creates the Office of Ergonomics Support and hires more ergonomists.
November 1990	OSHA/UAW/GM sign agreement bringing ergonomics programs to 138 GM plants employing more than 300,000 workers. Throughout the early 90s, OSHA signed 13 more corporate-wide settlement agreements to bring ergonomics programs to nearly half a million more workers.
July 1991	OSHA publishes ''Ergonomics: The Study of Work,'' as part of a nationwide education and outreach program to raise awareness about ways to reduce musculoskeletal disorders.
July 1991	More than 30 labor organizations petition Secretary of Labor to issue an Emergency Temporary Standard.
January 1992	OSHA begins a special emphasis inspection program on ergonomic hazards in the meatpacking industry.
April 1992	Secretary of Labor denies petition.
August 1992	OSHA publishes an Advance Notice of Proposed Rulemaking on ergonomics.
1993	OSHA conducts a survey of general industry and construction employers to obtain information on the extent of ergonomics programs in industry and other issues.
March 1995	OSHA begins a series of meetings with stakeholders to discuss approaches to a draft ergonomics standard.
January 1997	OSHA/NIOSH conference on successful ergonomic programs held in Chicago.
April 1997	OSHA introduces the ergonomics web page on the Internet.
February 1998	OSHA begins a series of national stakeholder meetings about the draft ergonomics standard under development.
March 1998	OSHA releases a video entitled ''Ergonomic Programs That Work.''
February 1999	OSHA begins small business (Small Business Regulatory Enforcement Fairness Act (SBREFA)) review of its draft ergonomics rule, and makes draft regulatory text available to the public.
April 1999	OSHA's Assistant Secretary receives the SBREFA report on the draft ergonomics program proposal, and the Agency begins to address the concerns raised in that report.
November 1999	OSHA publishes proposed ergonomics program standard.

A. Regulatory and Voluntary Guidelines Activities

In 1989, OSHA issued the *Safety and Health Program Management Guidelines* (54 FR 3904, Jan. 26, 1989), which are voluntary program management guidelines to assist employers in developing effective safety and health programs. These program management guidelines, which are based on the widely accepted industrial hygiene principles of management commitment and employee involvement, worksite hazard analysis, hazard prevention and control, and employee training, also serve as the foundation for effective ergonomics programs. In August 1990, OSHA issued the *Ergonomics Program Management Guidelines for Meatpacking Plants* (Ex. 2–13), which utilized the four program components from the safety and health management guidelines, supplemented by other ergonomics-specific program elements (*e.g.*, medical management). The ergonomic guidelines were based on the best available scientific evidence, the best practices of successful companies with these programs, advice from the National Institute for Occupational Safety and Health (NIOSH), the scientific literature, and OSHA's experience with enforcement actions. Many commenters in various industries have said that they have implemented their ergonomics programs primarily on the basis of the OSHA ergonomics guidelines (Exs. 3–50, 3–61, 3–95, 3–97, 3–113, 3–121, 3–125), and there has been general agreement among stakeholders that these program elements should be included in any OSHA ergonomics standard (Exs. 3–27, 3–46, 3–51, 3–61, 3–89, 3–95, 3–113, 3–119, 3–160, 3–184).

OSHA has also encouraged other efforts to address the prevention of work-related musculoskeletal disorders. For example, OSHA has actively participated in the work of the ANSI Z–365 Committee, which was tasked with the development of a consensus standard for the control of cumulative trauma disorders.

1. Petition for Emergency Temporary Standard

On July 31, 1991, the United Food and Commercial Workers Union (UCFW), along with the AFL–CIO and 29 other labor organizations, petitioned OSHA to take immediate action to reduce the risk to employees from exposure to ergonomic hazards (Ex. 2–16). The petition

requested that OSHA issue an emergency temporary standard (ETS) on ''Ergonomic Hazards to Protect Workers from Work-Related Musculoskeletal Disorders (Cumulative Trauma Disorders)'' under section 6(c) of the Act. The petitioners also requested, consistent with section 6(c), that OSHA promulgate, within 6 months of issuance of the ETS, a permanent standard to protect workers from cumulative trauma disorders in both general industry and construction.

OSHA concluded that, based on the statutory constraints and legal requirements governing issuance of an ETS, there was not a sufficient basis to support issuance of an ETS. Accordingly, on April 17, 1992, OSHA decided not to issue an ETS on ergonomic hazards (Ex. 2–29). OSHA agreed with the petitioners, however, that available information, including the Agency's experience and information in the ETS petition and supporting documents, supported the initiation of a rulemaking, under section 6(b)(5) of the Act, to address ergonomic hazards.

2. Advance Notice of Proposed Rulemaking

At the time OSHA issued the *Ergonomic Program Management Guidelines for Meatpacking Plants*, (Ex. 2–13), the Agency also indicated its intention to begin the rulemaking process by asking the public for information about musculoskeletal disorders (MSDs). The Agency indicated that this could be accomplished through a Request for Information (RFI) or an Advance Notice of Proposed Rulemaking (ANPR) consistent with the Administration's Regulatory Program. Subsequently, OSHA formally placed ergonomics rulemaking on the regulatory agenda (Ex. 2–17) and decided to issue an ANPR on this topic.

In June 1991, OSHA sent a draft copy of the proposed ANPR questions for comment to 232 parties, including OSHA's advisory committees, labor organizations (including the petitioners), trade associations, occupational groups, and members of the ergonomics community (Ex. 2–18). OSHA requested comments on what questions should be presented in the ANPR. OSHA received 47 comments from those parties. In addition, OSHA met with the Chemical Manufacturers Association, Organization Resources Counselors, Inc., and the AFL–CIO and several of its member organizations. OSHA reviewed the comments and submissions received and incorporated relevant suggestions and comments into the ANPR.

On August 3, 1992, OSHA published the ANPR in the **Federal Register** (57 FR 34192), requesting information for consideration in the development of an ergonomics standard. OSHA received 290 comments in response to the ANPR. Those comments have been carefully considered by the Agency in developing the proposed ergonomics program standard.

3. Outreach to Stakeholders

In conjunction with the process of developing the proposed ergonomics rule, OSHA has established various communication and outreach efforts since publication of the ANPR. These efforts were initiated in response to requests by individuals who would be affected by the rule (stakeholders) that they be provided with the opportunity to present their concerns about an ergonomics rule and that they be kept apprised of the efforts OSHA was making in developing a proposed rule. For example, in March and April 1994, OSHA held meetings with industry, labor, professional and research organizations covering general industry, construction, agriculture, healthcare, and the office environment. A list of those attending the meetings and a record of the meetings has been placed in the public record of this rulemaking (Ex. 26–1370).

In March, 1995, OSHA provided a copy of the draft proposed ergonomics rule and preamble to these same organizations. Thereafter, during April 1995, OSHA met again with these groups to discuss whether the draft proposed rule had accurately responded to the concerns raised earlier. A summary of the comments has been placed in the public record (Ex. 26–1370).

During 1998, OSHA met with nearly 400 stakeholders to discuss ideas for a proposed standard. The meetings were held in February, July and September of 1998. The first series of meetings was held in Washington, DC and focused on general issues, such as the scope of the standard and what elements of an ergonomics program should be included in a standard. The second series of meetings was held in Kansas City and Atlanta and focused on what elements and activities should be included in an ergonomics program standard. The third set of meetings was held in Washington, DC and emphasized revisions to the elements of the proposal based on previous stakeholder input. A summary of those meetings has been placed on the OSHA web site and in the public docket (Ex. 26–1370). After OSHA released a working draft of the proposed ergonomics standard to members of the Small Business Regulatory Enforcement Fairness Act Panel for review under that Act., the draft was posted on the OSHA web site (February 9, 1999).

4. Small Business Regulatory Enforcement Fairness Act (SBREFA) Panel

In accordance with SBREFA and to gain insight from employers with small businesses, OSHA, the Office of Management and Budget (OMB), and the Small Business Administration (SBA) created a Panel to review and comment on a working draft of the ergonomics program standard. As required by SBREFA, the Panel sought the advice and recommendations of potentially affected Small Entity Representatives (SERs). A total of 21 SERs from a variety of industries participated in the effort. The working draft, supporting materials (a brief summary of a preliminary economic analysis and risk assessment and other materials) were sent to the SERs for their review. On March 24–26, 1999, representatives from OSHA, SBA, and OMB participated in a series of discussions with the SERs to answer questions and receive comments from the SERs. The SERs also provided written comments, which served as the basis of the Panel's final report (Ex. 23). The final SBREFA Panel Report was submitted to the Assistant Secretary on April 30, 1999. The findings and recommendations made by the Panel are addressed in the proposed rule, preamble, and economic analysis (see the discussion in Section VIII, Summary of the Preliminary Economic Analysis and Initial Regulatory Flexibility Analysis).

B. Other OSHA Efforts in Ergonomics

In 1996, OSHA developed a strategy to address ergonomics through a four-pronged program including training, education, and outreach activities; study and analysis of the work-related hazards that lead to MSDs; enforcement; and rulemaking.

1. Training, Education, and Outreach

a. Training. The OSHA ergonomics web page has been an important part of the Agency's education and outreach effort. Other OSHA efforts in training, education and outreach include the following:

- Grants to train workers and employees about hazards and hazard abatement;
- Training courses in ergonomics;

- One day training for nursing home operators in each of five targeted states;
- Booklets on ergonomics, ergonomics programs, and computer workstations; and
- Videotapes on ergonomics programs in general industry and specifically in nursing homes.

OSHA has awarded almost $3 million for 25 grants addressing ergonomics, including lifting hazards in healthcare facilities and hazards in the red meat and poultry industries. These grants have enabled workers and employers to identify ergonomic hazards and implement workplace changes to abate the hazards.

Some grant program highlights follow.

- The United Food and Commercial Workers International Union (UFCW) conducted joint labor-management ergonomics training at a meatpacking plant that resulted in a major effort at the plant to combat cumulative trauma disorders. The program was so successful that management asked the UFCW to conduct the ergonomics training and work with management at some of its other facilities.
- The University of California at Los Angeles (UCLA) and the Service Employees International Union (SEIU) both had grants for preventing lifting injuries in nursing homes. SEIU developed a training program that was used by UCLA to train nursing home workers in California. UCLA also worked with some national back injury prevention programs. At least one of the nursing home chains has replicated the program in other states.
- Mercy Hospital in Des Moines, Iowa, had a grant to prevent lifting injuries in hospitals. It trained over 3,000 hospital workers in Des Moines and surrounding counties. It had a goal of reducing lost work days by 15 percent. The goal was surpassed, and, six months after the training, none of those trained had had a lost workday due to back injury.
- Hunter College in New York City is training ergonomics trainers for the United Paperworkers International Union. The trainers then return to their locals and conduct ergonomics training for union members. As a result of this training, changes are being made at some workplaces. Examples include purchasing new equipment that eliminates or reduces workers' need to bend or twist at the workstation, rotating workers every two hours with a ten-minute break before each rotation, and modifying workstations to reduce worker strain.

b. Education and Outreach. To provide a forum to discuss ergonomic programs and to augment information in the literature with the experience of companies of different sizes and from a variety of industries, OSHA and NIOSH sponsored the first in a series of conferences that brought industry, labor, researchers, and consultants together to discuss what works in reducing MSDs. The 1997 OSHA and NIOSH conference was followed by 11 more regional conferences across the country. OSHA and NIOSH held the second national conference on ergonomics in March of 1999. More than 200 presentations were given at the conferences on how companies have successfully reduced MSDs. Presentations were made by personnel from large and small companies in many different industries.

Other examples of successful ergonomics programs have come from OSHA's Voluntary Protection Program (VPP). The VPP program was established by OSHA to recognize employers whose organizations have exemplary workplace safety health programs. Several sites that have been accepted into VPP have excellent ergonomics programs.

2. Ergonomics Best Practices Conferences

During the period from Sept. 17, 1997 through Sept. 29, 1999, OSHA and its Regional Education Centers co-sponsored 11 Ergonomics Best Practices conferences. These Conferences were designed to provide good examples of practical and inexpensive ergonomics interventions implemented by local companies. The concept was that if OSHA and its Regional partners could initiate the development of a network of local employers, contractors, and educators to provide practical information to solve ergonomics problems, it would be assisting employers in providing a workplace for employees that would be ''free of recognized health and safety hazards.'' To date, attendance has exceeded 2,400 participants, including employers, contractors, and employees. Finally, OSHA has made numerous outreach presentations to labor, trade, industry and professional organizations during the development of the proposed rule.

3. Studies and Analyses

Throughout the 1990s and continuing to the present, OSHA staff have monitored the ergonomics literature, developed analyses, and reviewed the work of other Federal and non-Federal agencies and organizations related to ergonomics issues. In some cases, OSHA staff have conducted site visits to observe ergonomics programs at first hand. Much of the information learned through these activities is reflected in the material in this preamble.

The most important reports and studies to appear in the last few years are listed below. OSHA has reviewed each of these documents in detail, and findings from them that are relevant to the discussions in this preamble are referenced in the text. Important recent studies that have supported the conclusion that ergonomic interventions and programs are a successful way to reduce MSDs:

- Elements of Ergonomics Programs, NIOSH, 1998 (Ex. 26–2);
- Musculoskeletal Disorders and Workplace Factors, NIOSH, 1997 (Ex. 26–1);
- Worker Protection: Private Sector Ergonomics Programs Yield Positive Results, GAO 1997 (Ex. 26–5); and
- Work-related Musculoskeletal Disorders, NRC 1998 (Ex. 26–37).

Other reports that support the use of ergonomic interventions in the context of an ergonomics program include:

- ASC Z–365 draft, Control of Cumulative Trauma Disorders, June 1997; and
- Applied Ergonomics, case studies, Volume 2 (case studies from the OSHA/NIOSH conference 1999).

In addition, in 1994, OSHA conducted eight site visits to companies that have implemented ergonomic controls. These site visits were at the invitation of companies in industries including meatpacking, manufacturing, and automotive manufacturing. In conjunction with three of these site visits, OSHA also held ''town meetings'' with other industry, labor and professional representatives in the geographical area. These meetings allowed OSHA to learn about other ergonomic programs that have been implemented by companies in the same area as well as issues regarding an OSHA ergonomics rule.

4. Enforcement

In the absence of a federal OSHA ergonomics standard, OSHA has addressed ergonomics in the workplace under the authority of section 5(a)(1) of the OSHAct. This section is referred to as the General Duty Clause and requires employers to provide work and a work environment free from recognized hazards that are causing or are likely to cause death or serious physical harm.

OSHA has successfully issued over 550 ergonomics citations under the General Duty Clause. Only one case has been decided by the Occupational Safety and Health Review Commission. In the majority of these cases, employers have realized that the implementation of ergonomics programs is in their best interest for the reduction of injuries and illnesses. Examples of companies cited under the General Duty Clause for ergonomics hazards and which then realized a substantial reduction in injuries and illnesses after implementing ergonomics programs include: the Ford Motor Company, Empire Kosher, Sysco Foods, and Kennebec Nursing Home.

When serious physical harm cannot be documented in the work environment but hazards have been identified by OSHA, Compliance Officers both discuss the hazards with the employer during the closing conference of an inspection and write a letter to the employer. These letters are called ''ergonomic hazard alert letters.'' As of June 1, 1999, approximately 260 letters had been sent to employers. Ergonomic hazard alert letters have been sent to employers in approximately 50% of OSHA ergonomic inspections.

Since ergonomic solutions vary from one industry to another, OSHA has provided both general and industry-specific training to compliance officers. There are currently three main ergonomic courses offered to OSHA compliance staff: Introduction to Ergonomics, Ergonomics in Nursing Homes, and Ergonomics Compliance (an advanced ergonomics course). Over 600 compliance staff have been trained in just the past three years. These courses cover three weeks of material.

In addition, OSHA has appointed one Area Office Ergonomic Coordinator and a Regional Ergonomic Coordinator in every region. These coordinators meet monthly to discuss recent case developments and the scientific literature on ergonomics, share knowledge of ergonomic solutions, and ensure that enforcement resources are provided to compliance staff for enforcement. A PhD level, professionally certified ergonomist serves as the National Ergonomics Enforcement Coordinator in OSHA's Directorate of Compliance Programs.

5. Corporate Wide Settlement Agreements

Among the companies that were cited for MSD hazards, 13 companies covering 198 facilities agreed to enter into corporate-wide settlement agreements with OSHA. These agreements were primarily in the meat processing and auto assembly industries, but there were also agreements with telecommunications, textile, warehousing grocery, and paper companies. As part of these settlement agreements, the companies agreed to develop ergonomics programs based on OSHA's Meatpacking Guidelines (Ex. 2–13) and to submit information on the progress of their program.

OSHA held a workshop in March 1999, in which 10 companies described their experience under their settlement agreement and with their ergonomics programs. All the companies that reported results to OSHA showed a substantially lower severity rate for MSDs since implementing their programs (Ex. 26–1420). In addition, most companies reported lower workers' compensation costs, as well as higher productivity and product quality. A report from the March 1999 workshop on corporate wide settlement agreements summarizing the results from 13 companies involved in the agreements has been placed in the docket (Ex. 26–1420). Only 5 of the 13 companies consistently reported the number of MSD cases or MSD case rates. All five companies that reported data on MSD-related lost workdays showed a significant decline in the number of lost workdays. None of the companies that reported severity statistics showed an increase in lost workdays as a result of the ergonomics program.

C. Summary

As this review of OSHA's activities in the last 20 years shows, the Agency has considerable experience in addressing ergonomics issues. OSHA has also used all of the tools authorized by the Act—enforcement, consultation, training and education, compliance assistance, the Voluntary Protection Programs, and issuance of voluntary guidelines—to encourage employers to address musculoskeletal disorders, the single largest occupational safety and health problem in the United States today. These efforts, and the voluntary efforts of employers and employees, have led to a recent 5-year decline in the number of reported lost workday ergonomics injuries. However, in 1997, more than 626,000 such injuries and illnesses were still reported. Promulgation of an ergonomics program standard will add the only tool the Agency has so far not deployed against this hazard—a mandatory standard—to these other OSHA and employer-driven initiatives. Over the first 10 years of the standard's implementation, OSHA predicts that more than 3 million lost workday musculoskeletal disorders will be prevented in general industry. Ergonomics programs can lead directly to improved product quality by reducing errors and rejection rates. In an OSHA survey of more than 3,000 employers, 17 percent of employers with ergonomics programs reported that their programs had improved product quality. In addition, a large number of case studies reported in the literature describe quality improvements. Thus, in addition to better saftey and health for workers, the standard will save employers money, improve product quality, and reduce employee turnover and absenteeism.

III. Pertinent Legal Authority

The purpose of the Occupational Safety and Health Act (''OSH Act''), 29 U.S.C. 651 *et seq.*, is ''to assure so far as possible every working man and woman in the nation safe and healthful working conditions and to preserve our human resources.'' 29 U.S.C. 651(b). To achieve this goal Congress authorized the Secretary of Labor to promulgate and enforce occupational safety and health standards. 29 U.S.C. 655(b) (authorizing promulgation of standards pursuant to notice and comment), 654(b) (requiring employers to comply with OSHA standards).

A safety or health standard is a standard ''which requires conditions, or the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment or places of employment.'' 29 U.S.C. 652(8).

A standard is reasonably necessary or appropriate within the meaning of Section 652(8) if:

- A significant risk of material harm exists in the workplace and the proposed standard would substantially reduce or eliminate that workplace risk;
- It is technologically and economically feasible;
- It is cost effective;
- It is consistent with prior Agency action or supported by a reasoned justification for departing from prior Agency action;
- It is supported by substantial evidence; and
- If this standard is preceded by a national consensus standard, it is better able to effectuate the purposes of the OSH Act than the standard it supersedes.

International Union, UAW v. *OSHA (LOTO II),* 37 F.3d 665 (D.C. Cir. 1994); 58 FR 16612—16616 (March 30, 1993).

OSHA has generally considered an excess risk of 1 death per 1000 workers over a 45-year working lifetime as clearly representing a significant risk. *Industrial Union Dept.* v. *American Petroleum Institute (Benzene),* 448 U.S. 607, 646 (1980); *International Union* v. *Pendergrass (Formaldehyde),* 878 F.2d 389, 393 (D.C. Cir. 1989); *Building and Construction Trades Dept., AFL–CIO* v. *Brock (Asbestos),* 838 F.2d 1258, 1264–65 (D.C. Cir. 1988).

A standard is technologically feasible if the protective measures it requires already exist, can be brought into existence with available technology, or can be created with technology that can reasonably be expected to be developed. *American Textile Mfrs. Institute* v. *OSHA (Cotton Dust),* 452 U.S. 490, 513 (1981), *American Iron and Steel Institute* v. *OSHA (Lead II),* 939 F.2d 975, 980 (D.C. Cir. 1991).

A standard is economically feasible if industry can absorb or pass on the costs of compliance without threatening the industry's long-term profitability or competitive structure. See *Cotton Dust,* 452 U.S. at 530 n. 55; *Lead II,* 939 F.2d at 980.

A standard is cost effective if the protective measures it requires are the least costly of the available alternatives that achieve the same level of protection. *Cotton Dust,* 453 U.S. at 514 n. 32; *International Union, UAW* v. *OSHA (LOTO III),* 37 F.3d 665, 668 (D.C. Cir. 1994).

All standards must be highly protective. See 58 FR 16612, 16614–15 (March 30, 1993); *LOTO III,* 37 F.3d at 669. However, health standards must also meet the ''feasibility mandate'' of section 6(b)(5) of the OSH Act, 29 U.S.C. 655(b)(5). Section 6(b)(5) requires OSHA to select ''the most protective standard consistent with feasibility'' that is needed to reduce significant risk when regulating health hazards. *Cotton Dust,* 452 U.S. at 509.

Section 6(b)(5) also directs OSHA to base health standards on ''the best available evidence,'' including research, demonstrations, and experiments. 29 U.S.C. 655(b)(5). OSHA shall consider ''in addition to the attainment of the highest degree of health and safety protection * * * the latest scientific data * * * feasibility and experience gained under this and other health and safety laws.'' *Id.*

Section 6(b)(7) authorizes OSHA to include among a standard's requirements labeling, monitoring, medical testing and other information gathering and transmittal provisions, as appropriate. 29 U.S.C. 655(b)(7).

Finally, whenever practical, standards shall ''be expressed in terms of objective criteria and of the performance desired.'' *Id.*

IV. Summary and Explanation

Based on the best currently available evidence, OSHA has preliminarily concluded that the requirements of the proposed Ergonomics Program Standard are reasonably necessary and appropriate to provide adequate protection from hazards that are reasonably likely to cause or contribute to work-related musculoskeletal disorders.

In developing this proposed rule, OSHA has carefully considered the large body of scientific articles and studies, as well as other data that OSHA has collected since the initiation of the Agency's ergonomic efforts more than a decade ago. In particular, OSHA has carefully considered the large number of pathophysiological, biomechanical and epidemiologic studies on MSD hazards, including those that were reviewed by NIOSH and NRC/NAS in their comprehensive studies in 1997 and 1998, respectively. Examples of other data OSHA has carefully considered in developing the proposed rule include case studies, papers, and ''best practices'' about ergonomics programs and controls that have been successfully implemented by a number of establishments.

OSHA also met with more than 400 stakeholders in several informal meetings during the development of the proposed rule, and considered the major points raised by the stakeholders during these meetings. In addition, the proposed rule has undergone the Panel review process required by the Small Business Regulatory Enforcement Fairness Act (SBREFA) 5 U.S.C. Chapter 8. All of the information developed to assist the small entity representatives (SERs) involved in the SBREFA process, the comments of the representatives, and the Panel's report and recommendations to OSHA have been placed in the rulemaking record (Ex. 23). Moreover, in conjunction with the SBREFA process, OSHA released a draft, on the OSHA web page, of the proposed rule and carefully considered stakeholder comments on that draft.

When a final standard is published, OSHA will undertake a number of outreach and compliance assistance activities. These will be particularly beneficial to small businesses. Outreach and compliance assistance activities OSHA intends to make available include:

- Publication of booklets summarizing the standard and providing specific information about different ways in which employers can comply with the standard;

- Development of computer-based materials to help small businesses identify and respond to MSDs and MSD hazards;

- Development of a Small Entity Compliance Guide, as required by SBREFA; and

- Development of a compliance directive that answers compliance-related questions about the standard.

In this summary and explanation for the proposed rule, OSHA has provided a number of examples of practices and controls that the Agency believes will work to reduce MSDs and exposure to MSD hazards. Although these certainly are not the only ways employers could comply with the proposed rule, the discussion provides information that employers can use or adapt for their workplaces. OSHA has used a variety of methods to help stakeholders understand the proposed requirements. For example, the summary and explanation includes a number of tables, exhibits and figures to show data, examples, requirements and ways to comply with the requirements. To make the preamble easier to use, the discussion of each provision of the proposed rule begins with a reprint of that provision from the proposed rule. In addition, the summary and explanation is included at the beginning of the preamble so stakeholders understand what the proposed rule would require when they examine other sections of the preamble, such as the information on the costs and impacts of the proposed rule.

OSHA believes that this proposed ergonomics program standard fulfills a promise President Clinton and Vice-President Gore made in the 1995 National Performance Reveiw document, ''The New OSHA: Reinventing Worker Safety and Health.'' That document promised that OSHA would address the issue of ergonomics by working with business and labor to develop a flexible, plain-language ergonomics standard. The standard being proposed today reflects OSHA's commitment to common-sense rulemaking.

Does This Standard Apply to Me? (§§ 1910.901–1910.904)

The discussion of ''Does this standard apply to me?'' (*i.e.*, Scope of the proposed ergonomics program rule) is divided into three parts. Part A explains what employers and jobs the proposed standard covers. Part B discusses the definitions of the covered jobs and the other sections related to the Scope of the standard. Part C addresses OSHA's authority to limit the scope of the ergonomics program standard.

A. Industries, Employers and Jobs This Standard Covers

1. How Serious Is the Problem of Work-Related MSDs?

The problem of occupational musculoskeletal disorders (MSDs) is serious and widespread, and the scope of the proposed standard is also broad, so that it will capture a substantial portion of these MSDs. Lost workday MSDs constitute one-third of all job-related injuries and illnesses reported to BLS every year.

a. MSD cases. Since 1993, the first year BLS began reporting data on musculoskeletal disorders, private industry employers have reported more than 620,000 MSDs every year that have been serious enough to result in days away from work for the employee, according to the Bureau of Labor Statistics (BLS). (These MSDs are referred to in this preamble as ''lost-workday MSDs'' or ''LWD MSDs.'') MSDs now account for one-third of all reported LWD injuries and illnesses. The total number of reported MSDs, lost-time and non-lost-time MSDs combined, is much higher. The combined total is estimated to be almost three times higher than the number of LWD MSDs. (BLS data indicate that about two-thirds of all injuries and illnesses do not involve days away from work.)

b. Annual MSD rates. In addition, BLS data shows that annual incidence rates for LWD MSDs are high. In 1996, LWD MSD rates were as high as 36.58 per 1,000 full-time employees (FTE) (SIC 45—Transportation by Air). For a number of 2-digit industry sectors, LWD MSD rates exceeded 10 per 1,000 FTE. And only three industry sectors had an annual rate of less than 1 LWD MSD per 1,000 FTE. (A detailed discussion of LWD MSD cases and rates by industry and occupation are presented in the Preliminary Risk Assessment Section VI.)

c. Lifetime MSD rates. The lifetime rates for LWD MSDs are substantially higher. The estimated probability that a worker will experience at least 1 work-related MSD during a working lifetime (45 years) ranges from 24 to 813 per 1,000 FTE, depending on the industry sector. In addition, it is possible for a worker to experience more than one MSD in a working lifetime. There is evidence in the record indicating that many employees working in establishments without an ergonomics program have suffered more than one serious MSD (Exs. 26–23, 26–24, 26–25, 26–26, 26–1263, 26–1370). For example, a number of employees have had multiple surgeries for carpal tunnel syndrome (CTS). The expected number of MSDs that will occur during a working lifetime among 1,000 FTE workers who begin working in an industry at the same time ranges from 24 to 1,646, for various general industry sectors (see Section VII, Significance of Risk).

d. MSD costs. Each year MSDs alone account for about $15–20 billion in workers' compensation costs, which is roughly $1 of every $3 spent for workers' compensation. The average costs for MSD cases are higher than those for other injuries. For example, the average per case costs for carpal tunnel syndrome cases are $8,070, which is more than double the $4,000 average per case costs for all other injuries and illnesses (Exs. 26–43, 26–1286). According to Liberty Mutual Insurance Company, low-back pain is the most prevalent and costly work-related MSD in the nation. Low-back pain MSDs account for 15% of all Liberty Mutual workers' compensation claims and 23% of the costs of these claims (Ex. 26–54).

e. MSDs widespread. Data and other evidence show that the problem of work-related MSDs is widespread. Stakeholders have told OSHA that MSDs and MSD hazards are found in every industry in the nation (Ex. 3–59, 3–183, 3–184, 3–217). And each year employers in every industry report substantial numbers of LWD MSDs. In 1997, more than 626,000 LWD MSDs were reported in private industry, about 567,000 of which were in general industry. (See Section VI, Preliminary Risk Assessment, for a more detailed discussion of the number and rates of MSDs reported to the Bureau of Labor Statistics.)

2. Why and How Is OSHA Limiting the Scope of the Proposed Ergonomics Program Standard?

Although these and other data indicate that the problem of MSDs is serious and widespread, for several reasons OSHA believes it is prudent to proceed with the ergonomics rulemaking in phases. Regulating workplace exposure to MSD hazards presents special problems. In particular, the analysis and control of MSD hazards involves complex issues, because most often several ergonomic risk factors combine to create an MSD hazard, and these risk factors occur in many different combinations. The multi-factoral nature of MSD hazards also makes the development of a rule to address these hazards more complex, because it requires more Agency resources for the rulemaking, for additional analyses, and for materials for effective outreach and training.

OSHA applied two general principles in determining the scope of the first phase of the Ergonomics Program Standard. OSHA decided to focus on those areas where: (1) The problems are severe, and (2) the solutions are well-understood.

These principles are consistent with statutory factors governing OSHA rulemakings, including the criteria in section 6(g) of the OSH Act that OSHA must consider when setting rulemaking priorities. 29 U.S.C. 655(g). They are also consistent with the feasibility and substantial evidence requirements in the OSH Act. 29 U.S.C. 655(b)(5).

Applying these principles, OSHA made two basic decisions on the scope of the first phase of the Ergonomics Program Standard. OSHA first decided to limit the proposed standard to general industry because that is where the Agency has the most data and evidence on ergonomics solutions. And OSHA decided to focus on three areas within general industry where the problem is likely to be severe.

a. General industry. The vast majority of the large body of evidence and data showing that ergonomics programs and control interventions are successful in reducing MSDs pertains to general industry. (Exs. 26–1, 26–37). For example, the vast majority of studies reviewed in the NIOSH and NRC/NAS reports pertain to general industry. Almost all of the studies on the effectiveness of ergonomics programs and control interventions focused on general industry (see Section VI, Preliminary Risk Assessment). The vast majority of the success stories OSHA has gathered on the accomplishments of employers with ergonomics programs pertain to general industry employers. (See discussion of Job Hazard Analysis and Control below in this section, and the Preliminary Economic Analysis, for control scenarios and success stories.)

Evidence on ergonomic solutions from OSHA's own experience dealing with MSD hazards is also primarily derived from general industry. For example, all of OSHA's ergonomics enforcement experience under the General Duty Clause is in general industry. This includes more than 550 uncontested cases and 13 corporate settlement agreements covering 198 facilities.

Information about ergonomic solutions that OSHA has derived from the hundreds of ergonomics consultations the Agency pertains primarily to general industry. OSHA's ergonomics guidance and outreach efforts have been directed to general industry because most of the data and information are there. For example, the ergonomics program management guidelines OSHA published in 1990 focused on the red meat industry (Ex. 26–3). OSHA's other major ergonomics initiative targeted the nursing homes industry, a service industry within the general industry sector.

OSHA recognizes that MSD problems are also serious in the construction, maritime and agricultural industries. In 1996 alone, employers in these industries reported more than 60,000 LWD MSD. In the Construction—Special Trades industry sector (SIC 17), more than 35,000 LWD MSDs were reported, and the incidence rate was 11.57 per 1,000 FTE. OSHA intends to conduct rulemaking for those sectors at a later date. However, at this time the Agency has less well-developed data on ergonomics solutions in the construction, maritime and agriculture industries, and these industries have unique characteristics that warrant separate rulemakings. (Part C discusses the characteristics in those industries.)

b. Covered jobs. Within general industry, OSHA is applying the proposed rule to the following three areas where the problem is especially likely to be severe:

- Manufacturing production jobs;
- Manual handling jobs requiring forceful exertions; and
- Jobs where ''OSHA recordable'' MSDs meeting the screening criteria are reported.

Manufacturing and manual handling jobs. Data and other evidence in the record indicate that in these jobs MSD hazards are especially likely to be present. (In the proposed rule MSD hazards are defined as ''physical work activities and/or physical work conditions in which risk factors are present, that are reasonably likely to cause or contribute to a covered MSD.''). BLS data and evidence in the record indicate that there is a heavy concentration of reported MSDs and MSD hazards in manual handling and manufacturing jobs. These jobs account for about 60% of all reported MSDs that are severe enough to have resulted in days away from work, even though manufacturing and manual handling jobs employ less than 28% of the general industry workforce, according to BLS.

For many occupations involving manufacturing or manual handling, MSD rates are high. In 1996, LWD MSD rates for occupations involving manufacturing and manual handling were as high as 30.4 and 42.4 per 1,000 FTE, respectively. For example, among nursing aides, orderlies and attendants, the LWD MSD rate was 31.6 per 1,000, and about 58,400 cases were reported. (For the entire health services industry sector, which involves a variety of patient handling tasks, more than 103,000 LWD MSDs were reported, or almost 15% of all private industry cases.)

The fact that manufacturing production and manual handling jobs account for the largest share of workers' compensation costs is another indication that there is likely to be a high concentration of MSD hazards in those jobs. MSDs of the back are one of the most costly workplace injuries and account for a very large percentage of permanent occupational disability cases and costs. As mentioned above, according to Liberty Mutual Insurance Company (1988, Ex. 26–54), MSDs of the back are the most prevalent and costly work-related MSD in the nation.

Other general industry jobs in which covered MSDs occur. In general industry jobs other than manufacturing and manual handling, exposure to MSD hazards is more variable, depending on particular work activities and conditions. There are, however, a very large number of MSDs reported outside manufacturing and manual handling jobs. An employer's report of a work-related MSD that is serious enough to result in work restrictions, days away from work or medical treatment, is a logical indicator that MSD hazards are likely to be present in a job. OSHA is therefore extending coverage to jobs in which covered MSDs occur. This scope of coverage will reach jobs in which MSD hazards are likely to be present while excluding other jobs unless and until a covered MSD occurs in them.

Evidence of the severity of the MSD problem outside of manufacturing and manual handling includes the following. In 1996, about 230,000 LWD MSDs were reported in jobs other than manufacturing and manual handling. The annual LWD MSD rates that year exceeded 1 per 1,000 in all but three general industry sectors that typically do not involve manufacturing or manual handling jobs.

A significant percentage of carpal tunnel syndrome (CTS) cases, the type of MSD generally requiring the most extensive recovery time, is found in jobs other than manufacturing or manual handling. In 1996, CTS cases resulted in the highest median number of days away from work for any injury or illness: 25 days for CTS compared to 5 days for all injuries and illnesses combined. That year, more than 57% of lost-workday CTS cases involved more than 20 days away from work, and more than 42% of all lost-workday CTS cases involved more than 30 days away from work. For amputations and fractures, 32% and 36% of cases, respectively, involved more than 30 days away from work.

In conclusion, although the proposed rule applies to only three categories within general industry, it will capture those jobs in which 90% of LWD MSDs have been reported in recent years in private industry. And because there are so many well-recognized ergonomic solutions to MSD problems in general industry, OSHA believes the proposed standard should substantially reduce MSD hazards as well as the number and severity of work-related MSDs in covered industries. OSHA requests comment on the scope of the proposed rule, particularly on whether and to what extent the scope of the rule should be expanded or reduced.

B. Definitions of Manufacturing Jobs, Manual Handling Jobs and Jobs With MSDs and Explanation of Other Scope Sections

Part B discusses the Scope sections of the proposed rule. The first section explains the definitions of the jobs the proposed rule covers: manufacturing jobs, manual handling jobs, and jobs with covered MSDs. The second section discusses the other sections of the Scope of the proposed rule (§§ 1910.901–1910.904).

1. Definitions of Covered Jobs

The proposed rule is job-based, and the scope of the proposed rule is defined in terms of jobs: manufacturing jobs, manual handling jobs, and jobs in which an employee has experienced a covered MSD. The proposed rule applies

to employers who have any of these jobs, but only to the extent that their workplaces have such jobs. Where employers do not have manual handling or manufacturing jobs that have given rise to a covered MSD, the Ergonomics Program Standard would not apply at all.

a. Why is OSHA using a job-based approach for defining the scope of the proposed rule? OSHA is proposing a job-based approach for defining the scope and application of the ergonomics standard because this approach focuses on areas where MSD hazards are likely to be present, is relatively easy to apply, and appears to be more cost-effective than other approaches. OSHA believes employers should be able to determine whether the standard applies to them without having to do a job hazard analysis for all jobs in their workplace. In addition, the three job categories addressed by the scope should include most jobs in which MSD hazards are present.

Easy to apply. The three job categories OSHA is proposing to cover should help employers quickly focus on the areas where they need to be looking for ergonomic problems. Employers should know whether they have manufacturing production jobs or jobs where employees are regularly handling heavy loads. In addition, it should not be difficult for employers to determine whether they have OSHA recordable MSDs, since most of them are already familiar with recording work-related illnesses and injuries in order to comply with the OSHA recordkeeping rule, 29 CFR Part 1904. Even employers who do not keep OSHA 200 logs should not have difficulty identifying whether any of their employees has been injured to the extent that they require medical treatment, restricted work, transfer to an alternative duty job, or time away from work to recuperate.

''Proxy'' for MSD hazards. These three job categories are appropriate because each is an accurate and reasonable proxy for an increased risk of exposure to ergonomic hazards that are reasonably likely to cause or contribute to serious physical harm, that is, to a covered MSD. For example, manufacturing production jobs frequently involve repetition of the same task throughout the workday, without much variation. A large body of evidence, which is discussed in greater detail in the Health Effects section (Section V), shows that employees who have frequent and/or prolonged exposure to highly repetitive motions (particularly when they are carried out in combination with high force and/or awkward postures) have a much higher risk of developing an MSD as compared to employees with lower levels of exposure (See *e.g.*, NIOSH, 1997, Ex. 26–1; Bernard, 1993, Ex. 26–439; Higgs *et al.* 1992, Ex. 26–1232; Burt *et al.* 1990, Ex. 26–698; deKrom *et al.* 1990, Ex. 26–41; Silverstein *et al.* 1987, Ex. 26–34; Armstrong *et al.* 1987, Ex. 26–48). The high incidence rates in manufacturing production occupations confirm this. OSHA is not saying that all manufacturing jobs present MSD hazards. OSHA is saying that manufacturing jobs present an increased risk of such hazards, and it is therefore logical to cover them in the proposed standard.

The same is true for manual handling jobs. Manual handling jobs typically involve regular lifting of heavy loads. A large body of evidence shows that doing forceful exertions repeatedly or for a prolonged period of time significantly increases the risk of developing an MSD of the back (*See e.g.*, NIOSH, 1997, Ex. 26–1; Holmstrom *et al.*, 1992, Ex. 26–36; Punnett *et al.*, 1991, Ex. 26–36; Liles *et al.*, 1984, Ex. 26–33). Occupations and industries where these hazards are present have very high LWD MSD rates and a large number of cases. As mentioned above, in 1996, nurses aides, orderlies and health care attendants, who spend much of their time doing patient lifting tasks, had an annual LWD MSD rate of 31.6 per 1,000 FTE, and the health services industry alone accounted for almost 15% of all LWD MSD cases. Finally, the report of an MSD that is serious enough to warrant recording on the OSHA 200 log is a logical indicator that MSD hazards may be present, especially since assessing the work-relatedness of the MSD for the purposes of this standard involves a determination by the employer about whether the MSD has a connection to the activities and conditions of the job.

More practical and less-burdensome. Although not a perfect indicator of the presence of MSD hazards, reliance on the these job categories to determine the scope of the proposed standard is more practical than other approaches. Using this approach, employers do not have to do a job hazard analysis of their facility or use a checklist to screen all of their jobs, and do not have to measure the total weights lifted by an employee or the number of repetitions made, to determine whether the standard applies to them. Thus, the job-based approach does not require employers to spend much time and resources reviewing the standard to determine whether they are covered or reviewing jobs where no hazard exists. OSHA believes that determining in the first instance whether the standard applies should require nothing more of employers than a common sense determination as to whether they have manufacturing productions jobs, forceful manual handling jobs, or jobs with OSHA recordable MSDs. OSHA anticipates that employers should be able to make this determination based on existing knowledge rather than on formal job analysis.

OSHA agrees with stakeholder and SBREFA Panel comments to the effect that the scope should be easy to understand. Accordingly, to help employers understand the scope of the rulemaking, the definitions of manufacturing and manual handling jobs include examples of jobs that would typically be included in and excluded from the definition (see § 1910.945).

b. What about other methods for defining scope? OSHA believes the job-based approach is superior to other ways of defining coverage, because, on balance, it is the most accurate of the cost-effective approaches to reducing MSD hazards. OSHA presents alternative approaches below and requests comment on this issue.

Preliminary job hazard analysis. OSHA considered requiring all general industry employers to do an initial job hazard analysis for all jobs in the workplace to identify those jobs where MSD hazards are present. That approach is similar to the approach OSHA uses in other health standards. In those standards, employers make an initial assessment about the presence of hazardous substances in the workplace (*i.e.*, ''Do I have operations that involve formaldehyde in my workplace?''). Requiring a preliminary job hazard analysis to screen for ergonomic hazards is analogous to this initial assessment for toxic substances. Although conducting a preliminary analysis is the most thorough and accurate way to initially determine whether MSD hazards are present, it is more resource-intensive for employers. To the extent that doing an initial job hazard analysis would require employers to expend considerable resources and efforts where no MSD hazards are present, it would not be cost-effective. In contrast, the practical design of the proposed job-based approach allows employers to make common sense determinations about whether the proposed rule applies, rather than requiring that the determination be based on a formal job hazard analysis. At the same time, since evidence in the record shows that MSD hazards are likely to be present in these jobs and that these three categories account for such a large proportion of all

reported MSDs, using the three job categories is a reasonably accurate approach.

Specification. OSHA also could have used a specification approach in the proposed rule, defining coverage by specific measurements such as weight limits, number of repetitions, or number of hours performing a certain job or task demand. A number of studies have identified exposure-response relationships in particular circumstances (Holmstrom *et al.* 1992, Ex. 26–36 ; Punnett *et al.* 1991, Ex. 26–39; de Krom *et al.* 1990, Ex. 26–41; Liles *et. al.* 1984, Ex. 26–33), and a number of models exist for equating safe levels of exposure (*e.g.*, NIOSH Lifting Index, Ex. 26–572; Snook ''Push-Pull'' tables, Ex. 26–1008).

Specification approaches, however, are more likely to be overinclusive or underinclusive. See *International Union, UAW* v. *OSHA (LOTO II),* 37 F.3d 665 (D.C. Cir. 1994). For example, if the proposed rule were to cover any task that required lifting a certain weight (*e.g.*, more than 40 pounds), the proposed rule might not cover a number of very hazardous lifting tasks in which MSDs are reasonably likely to occur. This is because the weight limit might not adequately consider the impact of other factors on the force required to complete a lift. To illustrate, a task requiring an employee to lift 40 pounds may be safe if twisting, bending or reaching is not involved, but it could be unsafe if long horizontal reaches or bending is required.

On the other hand, a proposed rule that defined coverage in terms of a weight limit that takes other ergonomic risk factors into account could be overinclusive because the recommended lift weight could vary greatly with each lifting task. For example, a lifting task that does not involve any risk factors other than force would be treated the same as a lift involving many risk factors. However, to expand a specification approach to make it more precise (*i.e.*, so that it was not underinclusive or overinclusive) would necessarily make the approach more complex. It would require employers to determine what risk factors are present in order to determine their impact on the weight limit, and thus would essentially require a basic job hazard analysis simply to make a decision about whether they are subject to the rule.

Checklist. OSHA could also have used a checklist approach for defining coverage under the proposed ergonomics standard. A simple checklist has advantages: it can be administered by a person with limited training and is simple and fast to administer. However, some checklists are not designed to capture complex situations and thus might be underinclusive. For example, a simple checklist that omits questions that are important to a particular job might erroneously exclude a hazardous job or treat it as no more hazardous than another job. On the other hand, making a checklist more thorough and accurate would make it harder to use and more costly and complex.

Industry. Finally, OSHA could have defined the coverage of the standard purely by industry (*i.e.*, industries with the highest MSD rates), as some stakeholders have recommended. For several reasons, however, OSHA believes that this approach would not be as accurate as the proposed approach in focusing the standard on areas where the problem is severe. Regardless of the industry in which employees work, they face a significant risk of material harm when they are exposed to physical work activities and conditions that are reasonably likely to cause or contribute to a covered MSD. For example, in an industry where manual handling is rarely performed or is restricted to a small group of employees, the overall incidence rate for the industry is likely to be low. But even if the overall industry incidence rate is low, those employees who do perform manual handling and are exposed to MSD hazards are at significant risk of material health impairment. Conversely, an industry-based approach would result in low-hazard jobs in a covered industry being included, while employees performing identical jobs in other industries would be excluded. Defining coverage by industry, therefore, would make the standard both underinclusive and overinclusive.

In addition, using industry incidence rates is not necessarily an accurate measure of the prevalence of MSD hazards. For example, even where large numbers of MSDs are reported in an industry, the rate may still be low because the industry employs so many workers, some of whom are not exposed to the same degree to MSD hazards. In part, this is due to the fact that available industry classifications were established for purposes other than occupational safety and health analysis. Therefore, the courts recognized that such classifications ''appear essentially irrelevant'' to the task of regulating hazards. *LOTO II,* 37 F.3rd at 670.

In the remainder of this discussion, OSHA will describe the specific provisions of the proposed standard that deal with Scope.

c. *Manufacturing jobs.* Section 1910.901 Does this standard apply to me?

This standard applies to employers in general industry whose employees work in manufacturing jobs or manual handling jobs, or report musculoskeletal disorders (''MSDs'') that meet the criteria of this standard. This standard applies to the following jobs:

(a) Manufacturing jobs. Manufacturing jobs are production jobs in which employees perform the physical work activities of producing a product and in which these activities make up a significant amount of their worktime;

There are many kinds of jobs in manufacturing firms (*e.g.*, production, professional and technical, maintenance, repair, sales, etc.), some of which do not have exposure to MSD hazards. The proposed rule focuses on manufacturing jobs involving the physical work activities of production because these jobs present an increased risk of MSD hazards.

Production jobs. The manufacturing jobs the proposed rule covers are production jobs in manufacturing, those that directly involve production work tasks; they are the hands on jobs of processing, assembling, or fabricating finished or semi-finished products (durable and non-durable). Production work involves the range of tasks from handling raw materials or components through packaging the final product to leave the production facility. Manufacturing production jobs are frequently referred to as assembly line, production line, paced work, piecework, or factory jobs.

Evidence in the record indicates that MSDs reported in manufacturing are heavily concentrated in production jobs. All of the manufacturing occupations, as defined by the BLS, with high LWD MSD rates are production jobs. In 1996, for instance, the manufacturing jobs with the highest LWD MSD rates were the following production occupations:

- Machine feeders and offbearers 34.6 per 1,000 FTE
- Punching and stamping machine operators 30.4 per 1,000 FTE
- Sawing machine operators 18.9 per 1,000 FTE
- Furnace, kiln, oven operators (except food) 18.0 per 1,000 FTE
- Grinding, abrading, polishing machine operators 17.9 per 1,000 FTE
- Assemblers 16.2 per 1,000 FTE

The rate for each of these manufacturing production occupations substantially exceeded and in some cases was 5 times as high as the rate for all manufacturing injuries and illnesses combined (10.3 per 1,000 FTE). These rates were also more than 4 times higher than the LWD rate for all injuries and illnesses combined (2.5 per 1,000 FTE).

MSDs reported in manufacturing are heavily concentrated in production jobs because these are the jobs that are likely to involve significant exposure to the combinations of ergonomic risk factors that are associated with significantly elevated risks of harm. Studies show that production work tasks, which frequently involve highly repetitive tasks and are often combined with high force and awkward postures, are the jobs in manufacturing that are most closely associated with significantly-elevated risks of harm (See *e.g.*, NIOSH, 1997, Ex. 26–1; Bernard *et al.* 1993, Ex. 26–439; Higgs *et al.* 1992, Ex. 26–1232; Silverstein *et al.* 1987, Ex. 26–34; Armstrong *et al.* 1987, Ex. 26–48).

Duration. The manufacturing production jobs that the proposed standard covers are those in which employees perform production tasks for a ''significant amount'' of their worktime. In general, significant amount means that performing production tasks is a key or characteristic element of the employee's job. It will probably be obvious that employees are performing production tasks for a significant amount of their worktime. The purpose of the significant amount of the worktime aspect of the definition of manufacturing jobs is to reinforce that the definition is intended to include jobs in which production work is characteristic of the job, while excluding jobs in which an employer might, on rare occasions, perform production tasks. This is illustrated by the examples of jobs that are and are not typically included in the definition (see discussion of § 1910.945).

Evidence in the record, including that discussed in the Health Effects section (Section V), indicates that MSD hazards may be present where production work is performed for a significant amount of time. Job tasks that require the use of the same muscles or motions for long periods of time increase the likelihood of both localized and general fatigue. In general, the longer the period of continuous exertion, the longer the recovery or rest time required (NIOSH , 1997, Ex. 26–1). Studies show that one of the biggest contributors to the occurrence of MSDs in manufacturing production jobs is lack of adequate recovery time (Exs. 26–1, 26–1275). Inadequate recovery time may be the result of the length of time work tasks are performed (deKrom *et al.* 1990, Ex. 26–102), or the frequency with which job cycles are performed.

For example, the risk of developing carpal tunnel syndrome (CTS) increases steadily with increases in daily exposure to flexed or extended wrist postures (deKrom *et al.* 1990. Ex. 26–102). The odds ratio for wrist disorders for a group of employees exposed to flexed wrist postures between 8–19 hours a week (*i.e.*, an average of 1 to <4 hours per day) was 3, while that for employees exposed to these postures for between 20–40 hours a week (*i.e.*, an average of 4 to 10 hours per day) was 9 (deKrom *et al.* 1990, Ex. 26–102).

Other studies reach the same general conclusions. Researchers who reviewed the literature found that exposure to a combination of repetitive motions and either high forces, awkward postures or vibrating tools, or to various combinations of risk factors, for more than 4 hours a day puts workers at high risk of developing MSDs (Exs. 26–1163, 26–1352). (The relationship between duration of exposure to repetitive tasks and the occurrence of MSDs is discussed in greater detail in the Section V, Health Effects, of this preamble.) Although adverse effects have been reported following extremely high levels of exposure for very short durations (Hagberg, 1981, Ex. 26–955), studies show that exposure to workplace risk factors for less than 2 hours normally permits sufficient recovery time for the muscles, nerves and tendons in most workers to prevent chronic adverse health effects (Punnett *et al.*, 1991, Ex. 26–39; Punnet, 1998, Ex. 26–38)).

To clarify further the definition of manufacturing job, the proposed rule includes a list of examples of jobs that typically are included in and excluded from the proposed definition. This list is intended to be a practical guide about the kinds of jobs that OSHA intends to include as manufacturing production jobs. Table IV–1 includes this list:

Table IV–1

EXAMPLES OF JOBS THAT TYPICALLY ARE MANUFACTURING JOBS	EXAMPLES OF JOBS THAT TYPICALLY ARE NOT MANUFACTURING JOBS

• Assembly line jobs producing:
  • Products (durable and non-durable)
  • Subassemblies
  • Components and parts
• Paced assembly jobs (assembling and disassembling)
• Piecework assembly jobs (assembling and disassembling) and other time critical assembly jobs
• Product inspection jobs (*e.g.,* testers, weighers)
• Meat, poultry, and fish cutting and packing
• Machine operation
• Machine loading/unloading
• Apparel manufacturing jobs
• Food preparation assembly line jobs
• Commercial baking jobs
• Cabinetmaking
• Tire building
	• Administrative jobs
	• Clerical jobs
	• Supervisory/managerial jobs that do not involve production work
	• Warehouse jobs in manufacturing facilities
	• Technical and professional jobs
	• Analysts and programmers
	• Sales and marketing
	• Procurement/purchasing jobs
	• Customer service jobs
	• Mail room jobs
	• Security guards
	• Cafeteria jobs
	• Grounds keeping jobs (*e.g.,* gardeners)
	• Jobs in power plant in manufacturing facility
	• Janitorial
	• Maintenance
	• Logging jobs
	• Production of food products (*e.g.,* bakery, candy and other confectionary products) primarily for direct sale on the premises to household customers

d. Manual handling jobs.

(b) Manual handling jobs. Manual handling jobs are jobs in which employees perform forceful lifting/lowering, pushing/pulling, or carrying. Manual handling jobs include only those jobs in which forceful manual handling is a core element of the employee's job;

Note: Although each manufacturing and manual handling job must be considered on the basis of its actual physical work activities and conditions, the definitions section of this standard (§ 1910.945) includes a list of jobs that are typically included in and excluded from these definitions.

The second group of jobs OSHA is proposing to cover are manual handling jobs. Manual handling is the forceful movement (*i.e.,* lifting, lowering, pushing, pulling, carrying) of materials, equipment, objects, people or animals. The movement may be done by hand, as in lifting an object or pushing hand carts or pallets. The movement can also be done with the help of automated equipment or aids, such as forklift trucks, storage and retrieval systems, conveyors, and mechanical lift devices; such assisted handling would be considered manual handling as long as the movement still required forceful exertions by the employee.

The vast majority of MSDs reported in manual handling jobs are back disorders (*i.e.,* overexertions). For example, the jobs with the highest rate of time-loss injuries due to overexertion are those in nursing and personal care facilities, where employees are required to do frequent patient handling and lifting. Manual handling tasks are also associated with back pain in 25–70% of all worker's compensation claims (Snook and Ciriello, 1991, Ex. 26–1008; Cust *et al.,* 1972, Ex. 26–1194). There is also strong and consistent evidence that MSDs of the lower back are associated with work-related lifting and forceful exertions (see Section V below).

Most employees handle and move objects occasionally at the workplace. A number of stakeholders have expressed concern that the ergonomics standard would apply to any lifting, lowering, pushing, pulling or carrying tasks (collectively referred to as lifting) that employees do. That is not OSHA's intention, and the proposed definition of manual handling jobs clarifies that. Table IV–2 contains the examples of jobs from the definition that typically would be included in and excluded from the proposed rule:

Forceful lifting. Manual handling jobs are defined to include only those jobs that require forceful manual handling tasks. Force is the mechanical effort required to carry out a specific movement (NIOSH Elements of Ergonomics Programs, 1997, Ex. 26–2). Forceful exertions place higher loads on the muscles, tendons, ligaments, and joints (NIOSH 1997, Ex. 26–1; see also section V, Health Effects, of this preamble. Increasing the force required to lift a load also means increasing body demands (*i.e.,* greater muscle exertion is necessary to sustain the increased effort), and imposing greater compressive forces on the spine (Marras *et al.* 1995). As force increases, muscles fatigue more quickly. Prolonged or recurrent exertions of this type can also lead to MSDs where there is not adequate time for rest or recovery (NIOSH 1997, Ex. 26–1).

Studies indicate employees who perform forceful manual handling tasks face a significant risk of developing an MSD (See Health Effects, Chapter V). The majority of epidemiologic studies (13 of 18 studies) in the 1997 NIOSH review show that odds ratios are higher—in the range of 5.2 to 11—for employees who have high exposure to force and lifting. (These results are consistent with biomechanical and other laboratory evidence regarding the effects of lifting and dynamic motion on back tissues.) NIOSH also found that the high odds ratios for employees with high exposure were ''unlikely to be caused by confounding or other effects of lifestyle covariates'' (NIOSH 1997, Ex. 26–1).

Table IV–2

EXAMPLES OF JOBS THAT TYPICALLY ARE MANUAL HANDLING JOBS	EXAMPLES OF JOBS/TASKS THAT TYPICALLY ARE NOT MANUAL HANDLING JOBS
• Patient handling jobs (*e.g.,* nurses aides, orderlies, nurse assistants) • Package sorting, handling and delivering • Hand packing and packaging • Baggage handling (*e.g.,* porters, airline baggage handlers, airline check-in) • Warehouse manual picking and placing • Beverage delivering and handling • Stock handling and bagging • Grocery store bagging • Grocery store stocking • Garbage collecting	• Administrative jobs • Clerical jobs • Supervisory/managerial jobs that do not involve manual handling tasks or work • Technical and professional jobs • Jobs involving unexpected manual handling • Lifting object or person in emergency situation (*e.g.,* lifting or carrying injured co-worker) • Jobs involving manual handling that is so infrequent it does not occur on any predictable basis (*e.g.,* filling in on a job due to unexpected circumstances, replacing empty water bottle, lifting of box of copier paper) • Jobs involving manual handling that is done only on an infrequent ''as needed'' basis (*e.g.,* assisting with delivery of large or heavy package, filling in once for an absent employee) • Jobs involving minor manual handling that is incidental to the job (*e.g.,* carrying briefcase to meeting, carrying baggage on work travel)

Core element. Manual handling jobs are jobs in which manual handling tasks are a core element of the employee's job. A core element of a job refers to the tasks or physical work activities that are a key function of a job. Manual handling tasks may be a core element because they are a basic or essential function of a job. They may be a core element because they are frequently repeated or performed for a period of time. The following are examples of jobs in which manual handling would typically be considered a core element:

• Jobs where the basic purpose is to lift loads. These types of jobs include furniture moving, package and product delivery, and airline baggage handling;

• Jobs where lifting or pushing/pulling is an essential function of the job. Patient lifting, for example, is an essential element of nurse aide or health aide jobs and pushing is an essential element for orderlies;

• Jobs where manual handling is a regular element of the job cycle. These types of jobs typically include bringing supplies to a production workstation, loading machines for processing, and moving partially assembled products to the next workstation or onto or off a conveyor;

• Jobs where forceful exertions comprise a significant amount of the employee's work time. These jobs typically include warehousing, stocking and garbage collection;

• Jobs where employees end up doing manual handling on a routine or regular basis even if manual handing is not included in their job description. These jobs typically include unloading supplies or products that are delivered on a regular basis.

Including the concept of core element in the definition of covered manual handling jobs serves several purposes. First, it helps to ensure that employer attention is focused on those manual handling jobs for which data indicate that MSD hazards are most likely to be present: manual handling jobs with high MSD rates and numbers of cases. Studies indicate that manual handling jobs in which employees do forceful exertions repeatedly or for an appreciable period of time are associated with elevated risks of harm. For example, studies show a positive association between duration of exposure to workplace risk factors during manual handling and back pain (Wild 1995, Exs. 26–1104, 26–1105, 26–1106; Liles *et al.* 1984, Ex. 26–33). Studies also show that odds ratios for back MSDs increase significantly as daily duration of exposure to forceful manual handling increases (Holmstrom *et al.* 1992, Ex. 26–36; Punnett *et al.* 1991, Ex. 26–39; Liles *et al.* 1984, Ex. 26–33). Other studies indicate that the rate and duration of continuous lifting significantly reduces the worker's lifting capacity, making the worker more susceptible to MSDs associated with lifting (Snook and Ciriello, 1991, Ex. 26–1008).

Second, OSHA used core element rather than a duration component because, while duration and frequency play a role in determining whether the manual handling job imposes a risk of harm, studies show that employees can be at risk of developing an MSD at relatively short durations of lifting if the tasks involve extreme force (Hagberg 1981, Ex. 26–955) (see Section V of the preamble).

Finally, core element is a reasonable, shorthand way to inform employers that OSHA does not intend to cover manual handling that is so isolated or so incidental to the job that it is not reasonably likely to lead to an MSD. These types of jobs are not associated with high numbers or rates of MSDs.

OSHA requests information and comments about whether the Ergonomics Program Standard should include manual handling jobs. If so, how should manual handling jobs be defined? Should the definition use a flexible approach or be based on quantitative methods such as the NIOSH Lifting Equation?

c. Jobs with MSDs.

(c) Jobs with a musculoskeletal disorder. Jobs with an MSD are those jobs in which an employee reports an MSD that meets all of these criteria:

(1) The MSD is reported after [the effective date];

(2) The MSD is an *OSHA recordable MSD,* or one that would be recordable if you were required to keep OSHA injury and illness records; and

(3) The MSD also meets the screening criteria in § 1910.902.

Note to § 1910.901(c): In this standard, the term covered MSD refers to a musculoskeletal disorder that meets the requirements of this section.

The final group of jobs this standard proposes to cover are those in which an employee reports a musculoskeletal disorder (MSD).

What is an MSD? Musculoskeletal disorders are injuries or disorders of the:

- Muscles
- Tendons
- Joints
- Spinal discs
- Nerves
- Ligaments
- Cartilage

MSDs develop as a result of repeated exposure to ergonomic risk factors. The proposed rule covers the following ergonomics risk factors:

- Force (including dynamic motions)
- Repetition
- Awkward or static postures
- Contact stress
- Vibration
- Cold temperatures

MSDs covered by the proposed standard do not include injuries to muscles, nerves, tendons, ligaments, or other musculoskeletal tissues that are caused by accidents such as slips, trips, falls, being struck by objects, or other similar accidents.

Table IV–3 contains examples of MSDs that may develop as a result of exposure to the ergonomic risk factors the proposed rule covers:

Table IV–3

EXAMPLES OF MUSCULOSKELETAL DISORDERS THE ERGONOMICS PROGRAM STANDARD WOULD COVER IF CONDITIONS OF THE STANDARD ARE MET
• Carpal tunnel syndrome
• Epicondylitis
• Herniated spinal discs
• Tarsal tunnel syndrome
• Raynaud's phenomenon
• Sciatica
• Ganglion cyst
• Tendinitis
• Rotator cuff tendinitis
• DeQuervain's disease
• Carpet layers knee
• Trigger finger
• Low back pain

The presence of MSD signs and/or symptoms is usually the first indication that an employee may be developing an MSD. The proposed rule defines both terms.

MSD signs are objective physical findings that an employee may be developing an MSD.

MSD symptoms, on the other hand, are physical indications that an employee may be developing an MSD. Symptoms can vary in severity, depending on the amount of exposure to MSD hazards. Often symptoms appear gradually, for example, as muscle fatigue or pain at work that disappears during rest. Usually symptoms become more severe as exposure continues. For example, tingling in the fingers that formerly occurred only when the employee was doing a repetitive task subsequently continues even when the employee is off work or at rest. If the employee continues to be exposed, symptoms may increase to the point that they interfere with performing the job. For example, as exposure continues the employee's grip strength (*e.g.,* ability to hold or grip an object or exert pressure with the hand) may decrease to the point where the employee has difficulty holding tools or gripping objects. Finally, pain may become so severe that the employee is unable to perform physical work activities). Table IV–4 includes examples of MSD signs and symptoms that OSHA is proposing to cover in this standard:

Table IV–4

EXAMPLES OF MSD SIGNS AND SYMPTOMS	
MSD SIGNS	MSD SYMPTOMS
• Deformity • Decreased grip strength • Decreased range of motion • Loss of function	• Numbness • Tingling • Pain • Burning • Stiffness • Cramping

What MSDs does this standard cover? The proposed rule does not cover all MSDs, and thus a report of an MSD would not automatically require the employer to set up an ergonomics program or to provide MSD management. The proposed rule only covers those MSDs that meet all of the following requirements:

- They are ''OSHA recordable'' MSDs, and
- They are reported after the effective date of the standard, and
- They meet the screening criteria in § 1910.902 (*i.e.,* physical work activities and/or conditions are reasonably likely to cause the type of MSD reported and are a core element of the job and/or make up a significant amount of the employee's worktime).

OSHA recordable MSDs are those that meet the recording criteria of the OSHA recordkeeping rule, 29 CFR Part 1904. These MSDs must be recorded on the OSHA injury and illness logs, or are MSDs that would have to be recorded if the employer were obligated to keep such logs.

The OSHA recordkeeping rule does not require that every MSD be recorded.

The OSHA Meatpacking Guidelines explain what MSDs employers must record under the recordkeeping rule. A recordable MSD is a work-related MSD that results in one or more of the following:

- A diagnosis of an MSD by a HCP; or
- At least one positive physical finding, or
- An MSD symptom plus:
  - Medical treatment,
  - Restricted duty,
  - One or more lost work days, or
  - Transfer/rotation to another job.

Positive physical finding. A positive physical finding is a report of any of the MSD signs listed above that is observable

by the employer and/or HCP. It is also a positive result on a medical test (*i.e.*, Finkelstein's, Phalen's or Tinel's test) conducted by an HCP. Because a positive physical finding is able to be observed by others, unlike a symptom, OSHA considers positive physical findings to be a recordable MSD, even if the employee has not missed work, been placed on work restrictions, or received medical treatment for the problem.

MSD symptom plus other action. Under OSHA's recordkeeping rule, MSD symptoms are recordable if they have resulted in medical treatment beyond first aid, restricted duty, one or more days away from work or transfer/rotation to another job. For example, where an employer responds to an employee report of symptoms (*e.g.*, numbness in the fingers or pain in the wrist) by putting the employee in a light duty job or by directing the employee to stay at home to rest the injured area, the event must be recorded.

When an employee requires medical treatment to obtain relief from and resolve MSD signs or symptoms, the condition is a recordable MSD. Conservative medical treatment of MSDs, for example, may include prescription anti-inflammatories, splints or braces to immobilize movement of the injured area while at rest or sleeping, and/or physical therapy.

There are several reasons why OSHA is proposing to use an OSHA recordable MSD as an initial trigger, rather than other incident triggers (*e.g.*, MSD rates, any report of MSD signs or symptoms, accepted workers' compensation claims) to determine coverage. First, using an OSHA recordable should not be difficult or burdensome for most employers because they are familiar with this definition from their OSHA injury and illness logs. This is why many stakeholders said they supported using an OSHA recordable MSD in the ergonomics rule. Using the same definition for both rules (the recordkeeping and ergonomics rules) would reduce employer burdens in complying with the ergonomics rule because employers would not have to develop or learn a new recordkeeping system. In addition, it would reduce paperwork burdens because the OSHA logs would satisfy both the ergonomics rule and also the OSHA recordkeeping requirement.

Second, a number of stakeholders support using an OSHA recordable MSD because they believe it is a reasonable, objective definition. For example, a number of stakeholders oppose using any report of MSD symptoms because they are concerned that such reports may be subjective, and, unless the symptoms are persistent, may not really mean that an injury is present. These stakeholders also said that an OSHA recordable is more objective than other measures, such as the results of discomfort surveys.

Third, limiting coverage to jobs with a high incidence rate would have limited value. The typical job has between 1 to 10 employees, *i.e.*, between 1 and 10 employees in a given establishment perform the same job. Even if one of these employees has an MSD, the annual rate would be an unacceptably high incidence rate of 10%. For all except rare situations in which there are more than 100 employees with the same job, defining the trigger in terms of a rate is not fundamentally different from a one-incident trigger (see the discussion in Chapter VII of the Preliminary Economic Analysis, Ex. 28–1).

Defining coverage in terms of a job with a workers' compensation award would result in unequal treatment of employees and employers covered by the ergonomics standard. State workers' compensation laws vary significantly and the same MSD may not be compensable in all States. For example, some States compensate an injured employee only if MSD hazards are the predominant cause of the MSD or if there is clear and convincing evidence that the MSD hazard caused the MSD. In Virginia, a number of MSDs are not compensable (*e.g.*, rotator cuff syndrome). Moreover, defining an MSD in terms of workers' compensation claims puts employers who willingly acknowledge the work-relatedness of an MSD at a disadvantage compared to those employers who discourage claims and challenge compensation awards.

Finally, using an OSHA recordable MSD as the initial trigger would make the ergonomics rule more protective than using a number of the other MSD measures. Using an OSHA recordable MSD would require employers to respond to every MSD that is sufficiently important to warrant recording. In contrast, using multiple MSDs or incidence rates would mean that the ergonomics rule would not require some employers to provide protection or MSD management for the first employee who reports an MSD, even if the MSD is clearly work related or has resulted in severe permanent damage. (See OSHA's Initial Regulatory Flexibility Analysis in Chapter VII of the Preliminary Economic Analysis, Ex. 28–1, for an analysis of the potential impacts of alternative triggers.)

OSHA requests information and comment on its proposal to base coverage on the occurrence of an OSHA recordable MSD and an employer determination that the recordable also meets the screening criteria, as well as on alternative definitions of the term MSD that would be as protective as the proposed definition.

Reported after effective date. OSHA is also proposing to limit the MSDs that the standard would cover to those that are reported after the standard becomes effective, which is 60 days after the final Ergonomics Program Standard is published in the **Federal Register**. Coverage of the standard would not be triggered for MSDs that occurred before that date.

f. Screening criteria. The last requirement is that MSDs meet the criteria in § 1910.902. If the criteria are not met, the employer has no further obligation under the proposed rule.

Section 1910.902 Does this standard allow me to rule out some MSDs?

Yes. The standard only covers those OSHA recordable MSDs that also meet these screening criteria:

(a) The physical work activities and conditions in the job are reasonably likely to cause or contribute to the type of MSD reported; and

(b) These activities and conditions are a core element of the job and/or make up a significant amount of the employee's worktime.

The screening criteria limit coverage of the proposed standard to jobs where exposure to MSD hazards is reasonably likely to cause or contribute to the type of MSD reported, and the job activities are a core element of the job and/or make up a significant amount of the employee's worktime. Because MSD hazards are physical work activities or conditions that are reasonably likely to cause MSDs, normally the occurrence of a recordable MSD is a good indicator that an MSD hazard is present. However, there are occasions in which MSDs result from idiosyncratic or unusual work circumstances. While work-related, such an MSD may not evince underlying hazards of the type an ergonomics program is designed to address. For example, if an employee who routinely does heavy lifting incurs work-

related low back pain, that is precisely the type of MSD the work activities of the job are reasonably likely to have contributed to and would be the type of MSD hazard the ergonomics program is designed to control. If the same employee reports carpal tunnel syndrome, however, the situation is different. Of course, the condition may not be work-related. Even if it is, however, it is likely to be related to physical work circumstances or reactions that would not normally be taken into account in designing ergonomic controls. Because the occurrence of a recordable MSD is not a good proxy for an underlying hazard in this circumstance, the MSD would not be a covered MSD for purposes of this standard. For the reasons described in the explanation of manufacturing and manual handling jobs above, covered MSDs are limited to those that have a good nexus with the physical work activities and conditions of the job; that is, the physical work activities and conditions that are reasonably likely to result in the occurrence of an MSD are (1) a core element of the job, and/or (2) make up a significant amount of the employee's worktime.

2. Other Sections on Scope

Section 1910.903 Does this standard apply to the entire workplace or to other workplaces in the company?

No. This standard is job-based. It only applies to jobs specified in § 1910.901 not to your entire workplace or to other workplaces in your company.

Section 1910.903 specifies that the ergonomics rule would apply only to those jobs OSHA explicitly identified as covered jobs and ensures that the presence of a covered job does not bring the rest of the workplace under the ergonomics standard. This means that employers would not have to develop an ergonomics program that covers all jobs and employees in the workplace merely because one job in the workplace is covered by the ergonomics standard. Other jobs in the workplace would only be included under the standard if they meet the definition of a covered job or if they involve the same physical work activities and conditions as the job in which the employee experienced the covered MSD.

Some stakeholders recommended that if an ergonomics program is required in a workplace, it should cover the entire workplace. They said that a whole-workplace approach would be easier because it would eliminate the need to determine whether certain jobs are covered by the ergonomics rule or involve the same physical work activities and MSD hazards as the covered job (Ex. 26–1370). Some said that a facility-wide program achieves greater employee buy in and support for the ergonomics program. It would also create employee goodwill because all employees would be part of the program and would be provided protection, as opposed to a situation in which employees working side-by-side would not necessarily both be covered by the ergonomics program. Finally, stakeholders said they found that developing a facility-wide program was as a more efficient use of resources, because it eliminated duplication of efforts such as training. For these reasons, they said, many employers have taken this approach in their own workplaces.

OSHA agrees with stakeholders that there are advantages to facility-wide ergonomic programs and OSHA encourages employers to consider a facility-wide approach. However, OSHA is not proposing to require a workplace-wide approach because the risk factors are not present in every job to the extent that an MSD is reasonably likely to occur. The job-based coverage of the proposed rule ensures that employers focus first on the jobs where intervention is needed the most; that is, jobs in which the employees' exposure to the risk factors is significant enough that MSDs are occurring or reasonably likely to occur if exposure continues unabated. In any event, if other jobs in the workplace are or become problem jobs, those employees would also be included in the program required by the standard and would thus be provided protection from MSD hazards. Job-based coverage assures that employers are not required to expend resources on jobs in which there is little likelihood that MSD hazards are present.

The remaining half of section 1910.903 informs employers that their program for addressing problem jobs does not have to be applied corporate-wide. That is, the existence of a problem job in one workplace does not mean that employers have to set up an ergonomics program in every facility owned by the company in which that job is performed. OSHA is proposing to limit employer obligations to the facility in which the problem job is identified. At the same time, OSHA recognizes that a number of employers have developed corporate-wide ergonomics programs. OSHA notes that while the general program and protocols of such corporate programs are applied to all workplaces, job hazard analyses and determinations about whether and what actions are needed in specific jobs are usually made at the workplace level.

OSHA notes that, although the ergonomics rule would not apply corporate-wide, the employer will need to take action in other company-owned facilities if they have any of the problem jobs this standard covers (*e.g.*, if a covered MSD occurs there).

Section 1910.904 Are there areas this standard does not cover?

Yes. This standard does not apply to agriculture, construction or maritime operations.

OSHA is proposing to exclude firms engaged in agriculture, construction and maritime operations from the scope of the first phase of this ergonomics rulemaking. OSHA acknowledges that LWD MSD rates are also high in firms engaged in agriculture, construction and maritime operations. However, the unique problems (*e.g.*, jobs of very short duration, no fixed workstations) and the more limited information available on effective ergonomic controls in these workplaces have convinced OSHA that it must, for resource and priority-setting reasons, limit this first phase to general industry. OSHA has preliminarily decided to address the MSD hazards in firms engaged in these operations in a separate rulemaking. (OSHA's reasoning is discussed in detail in Part C below.)

OSHA intends to develop a separate ergonomics rule that can be tailored to the conditions that are unique to firms in these industries. In addition, OSHA believes that the experience it gains from the first phase will provide valuable assistance in developing an effective ergonomics rule for agriculture, construction and maritime.

OSHA requests comments and information about whether firms engaged in agriculture, construction and maritime operations should be included in this ergonomics standard at this time. In particular, OSHA requests comments and information about whether, for example, manual handling operations in agriculture, construction and maritime should be included in this first phase of the ergonomics rulemaking.

C. Authority and Reasons for Limiting Coverage of the Proposed Ergonomics Standard.

This section discusses OSHA's authority under the OSH Act to promulgate the ergonomics standard sequentially, and its reasons for limiting the proposed ergonomics standard at this time to the three types of jobs discussed above. This discussion focuses on the following questions:

- What authority and reasons support promulgating the Ergonomics Program Standard sequentially, and limiting the first phase to manufacturing jobs, manual handling jobs, and other jobs where an OSHA recordable MSD is reported?
- What authority and reasons support exclusion of the agriculture, construction and maritime industries from the proposed ergonomics standard?

1. Section 6(g)—OSHA Authority to Limit the Scope of Rulemakings

The OSH Act authorizes OSHA to use a phased approach to rulemaking, including focusing first on areas where the problem is severe and solutions are well-known. Section 6(g) of the OSH Act, 29 U.S.C. 655, permits OSHA to set priorities in establishing standards, including limiting the scope of particular standards and promulgating standards in phases. Section 6(g) provides:

> In determining the priority for establishing standards under this section, the Secretary shall give due regard to the urgency of the need for mandatory safety and health standards for particular industries, trades, crafts, occupations, businesses, workplaces or work environments. The Secretary shall also give due regard to the recommendations of the Secretary of Health, Education, and Welfare regarding the need for mandatory standards in determining the priority for establishing such standards.

In proposing the addition of section 6(g) to the OSH Act, Senator Jacob Javits explained that its purpose was ''to relieve the Secretary of the necessity of waiting to promulgate whatever standards he wishes across the board [by] allowing him to yield to more urgent demands before he tries to meet others. * * *'' Legislative History, 505.

The courts have broadly interpreted section 6(g) as ''clearly permit[ting] the Secretary to set priorities for the use of the agency's resources.'' *United Steelworkers of America* v. *Auchter (Hazard Communication),* 763 F.2d 728, 738 (3rd Cir. 1985); *Forging Industry Association v. OSHA (Noise),* 773 F.2d 1436, 1455 (4th Cir. 1985); *United States Steelworkers* v. *Marshall (Lead),* 647 F.2d 1189, 1309–1310 (D.C. Cir. 1980), cert. denied, 453 U.S. 913 (1981); *National Congress of Hispanic American Citizens* v. *Usery (Hispanic II),* 626 F.2d 882 (D.C. Cir. 1979); *National Congress of Hispanic American Citizens* v. Usery (Hispanic I), 554 F.2d 1196, 1199 (D.C. Cir. 1977). Section 6(g) authorizes OSHA to ''alter priorities and defer action due to legitimate statutory considerations,'' *Hispanic II,* 626 F.2d at 888 n. 30. In the PELs rulemaking, for example, the court upheld OSHA's decision to exclude exposure monitoring and medical surveillance provisions from the rule as being ''purely a matter of regulatory priority.'' *AFL–CIO* v. *OSHA (PELs),* 965 F.2d 962, 985 (11th Cir. 1992).

Section 6(g) also permits OSHA ''to promulgate standards sequentially.'' Hazard Communication, 763 F.2d at 738. See, *PELs,* 965 F.2d at 985 . For example, the courts have upheld OSHA's decisions to issue standards for general industry first and thereafter to develop separate rules for those other industries that may have unique problems requiring special consideration (*e.g.,* mobile jobs of very short duration in the construction industry). *Lead,* 647 F.2d at 1309–10. (See Confined Spaces standard, 29 CFR 1910.146.) Section 6(g) also authorizes OSHA to ''act in its legislative capacity 'to focus on only *one aspect of a larger problem*.' '' *Lead,* 647 F.2d at 1310 (citing Chief Justice Burger concurring in Benzene, 448 U.S. at 663 (1980)) (emphasis added). In the PELs rulemaking, OSHA limited the standard solely to revising exposure limits and excluded ancillary provisions designed to provide further protection even though most other health standards included such provisions. See, *PELs,* 965 F.2d at 985.

Although OSHA's discretionary authority under section 6(g) is quite broad, it is not absolute:

> The scope of an agency's discretion is bounded by law; an agency cannot justify a decision by reference to its discretionary authority, if the decision lies beyond the scope of agency's discretion. (citations omitted) A statute may define as off-limits to an agency a particular basis for a decision, just as it may foreclose a particular result altogether. *Farmworkers Justice Fund, Inc.* v. *Brock (Field Sanitation),* 811 F.2d 613, 620 (D.C. Cir.), vacated as moot, 811 F.2d 890 (1987).

The Supreme Court has made clear that an agency's decision will be set aside if it relied on factors which the Congress did not intend it to consider. *Motor Vehicle Manufacturers Assn.* v State Farm Mutual Automobile Insurance Co., 463 U.S. 29, 43 (1983). In section 6(g), Congress established factors OSHA must consider in setting its priorities: OSHA must give ''due regard to the urgency of the need'' for a standard in, among others, particular industries, occupations, workplaces, or work environments.[1] The court in Hazard Communication said that this language suggests a statutory standard by which to measure the exercise of OSHA's discretion. Hazard Communication, 763 F.2d at 738. Authorizing rulemaking priority for the most severe hazards also comports with the criteria of section 6(c), which authorizes OSHA to pursue expedited rulemaking (*i.e.,* emergency temporary standard) but only where employees are exposed to ''grave dangers.'' *Hispanic II,* 626 F.2d at 889 n.36.

The Third Circuit has held that there is another limit on OSHA's 6(g) authority depending on where OSHA is in the rulemaking process. Hazard Communication, 763 F.2d at 738. The court said that, in situations where OSHA is setting priorities for future rulemaking, the agency has great latitude under section 6(g) to address greater hazards first. *Id.* However, the court held that where OSHA has decided to promulgate a standard to address an issue it is not enough for the agency to declare that it has selected certain industries or jobs for coverage because they present greater hazards. *Id.* Where significant risk exists in other industries and a standard is feasible there as well, OSHA may exclude those industries only if covering them would ''seriously impede the rulemaking process.'' *Id.*

The standard in question, Hazard Communication (29 CFR 1910.1200), only required employers to provide employees with information and training about hazardous chemicals in the workplace, based on analyses generally conducted by the chemical manufacturer or importer. The standard did not require employers to analyze jobs, implement controls, or provide medical management. The court apparently believed that there was no substantial question about the feasibility of the rule, and therefore no question about whether the rule could be expanded without impeding the rulemaking process. It is not clear the court would have reached the same result or announced the same principle if the standard

[1] See also, *Hispanic I,* 554 F.2d at 1199 (''The Act has built in flexibilities that the Secretary may use, such as * * * the priorities between the various occupations that require standards. * * *'').

in question had posed more complex scientific and feasibility issues. In any event, OSHA's decision to limit the proposed standard is consistent with the Hazard Communication decision because, as discussed below, expansion of the rule at this time to include construction, maritime and agriculture would seriously impede the rulemaking process.

2. Focus on Jobs Where Problems Are Severe and Solutions Are Well-Understood

OSHA has developed a general principle, based on the underlying legislative intent and the case law interpreting section 6(g), that it proposes to follow in determining what jobs should be covered in the first phase of this rulemaking. As mentioned above, that principle is: Focus on areas where problems are severe and solutions are well-understood. OSHA's decision, based on this guiding principle, to cover manufacturing, manual handling and general industry jobs where there are MSDs is consistent with the language and legislative intent of section 6(g).

3. Reasons for Excluding Agriculture, Construction and Maritime Industries From the Proposed Standard

Some stakeholders recommended that the proposed rule be expanded to include all industries. They said that the number and rates of MSDs in the construction industry are very high. They added that incidence rates for some construction industries are higher than for some manufacturing industries that are to be covered in the first phase. However, for the reasons set forth below, OSHA is not proposing that the first phase of the Ergonomics Program Standard cover these other industries.

a. Unique problems. OSHA acknowledges that employees in the agriculture, construction and maritime industries face significant risk of harm due to exposure to MSD hazards. In 1996, for example, almost 65,000 employees in these industries reported MSDs that were serious enough to result in days away from work, according to OSHA's analysis of BLS data (Ex. 1413). This means that 10% of all reported lost-workday MSDs occurred in just three industry sectors. Nonetheless, consistent with its discretion under section 6(g), OSHA proposes to exclude these industries from this proposal and to give them special consideration in subsequent rulemaking. *Lead,* 647 F.2d at 1310.

First, work conditions and factors present in agricultural, construction and maritime activities often are quite different from those of general industry. To illustrate, much of construction work involves or is affected by an interaction among several factors. These factors include the following aspects or conditions of work:

- Consisting primarily of jobs of short duration;
- Under a variety of adverse environmental and workplace conditions (*e.g.,* cold, heat, confined spaces, heights);
- At non-fixed workstations or non-fixed work sites;
- On multi-employer work sites;
- Involving the use of ''day laborers'' and other short-term ''temporary workers,'';
- Involving situations in which employees provide their own tools and equipment; and
- Involving employees who may be trained by unions or other outside certifying organizations.

While some of these factors may be present at times in other industries, they are continuously present in construction. OSHA may need to develop an ergonomics standard that takes this range of special conditions into account. For example, OSHA may also need to revise job hazard analysis and hazard control provisions in the current proposal so they are effective for industries where jobs are of such short duration that they may be completed before analysis and control can be implemented. These and other unique work conditions also are present in agricultural and maritime activities. For example, in longshoring, quite often workers are obtained from union hiring halls where they have been trained and certified in the use of certain machinery.

In addition, as compared to the very large body of evidence that exists for general industry, OSHA's experience with and information about ergonomic solutions in the agriculture, construction and maritime industries are relatively limited. OSHA believes that the information it does have will support the promulgation of an ergonomics standard in these industries in the second phase of this rulemaking. However, the Agency needs more time to gather and analyze this evidence to develop an effective ergonomics standard for agriculture, construction and maritime. For example, OSHA must gather and examine information on the types of ergonomic controls that would work in an industry with a high number of non-fixed workstations.

Because of the unique problems in these industries, it could take considerably more time to gather the needed information. And after waiting until an equivalent body of evidence is gathered and analyzed for these industries, the evidence might still show that separate ergonomics rules are warranted for construction, agriculture and maritime in any event.

b. Substantially impede the rulemaking. Implicit in setting rulemaking priorities based on the urgency of the need for action is whether a standard can be issued in a time frame that is responsive to the urgent need. Another reason OSHA is proposing to limit the ergonomics rule to general industry is that OSHA believes that expanding the rule to cover agriculture, construction and maritime would seriously delay addressing the urgent need for protection in the covered jobs. This is because information and experience on ergonomics in these industries is more limited than is the case in general industry. Expanding the scope could place substantial additional burdens on an already complex rulemaking. For example, if OSHA must first gather and analyze evidence for every industry before it may propose an ergonomics standard, 90% of the employees who already have been injured and for whom a standard can be promulgated now may be forced to wait for their urgently needed protection until OSHA is also able to provide it to the remaining employees exposed to MSD hazards. Also, expanding the scope of this proposed standard could strain OSHA's limited resources to the detriment not only of the ergonomics rulemaking but to other OSHA priorities as well, including other priorities for the construction, maritime and agricultural industries.

On the other hand, focusing on areas where a large body of evidence of effective ergonomics programs and control interventions exists should help OSHA to respond quickly to urgent situations where worker protection is needed now. Limiting the scope of the proposed rule at this time is thus fully consistent with OSHA's obligations under section 6(g).

By contrast, in agriculture, construction and maritime, the information on ergonomics programs and interventions is more limited. Only now is NIOSH conducting a study on ergonomic problems and interventions in the shipyard

industry, and the results of that study are not expected for more than a year.

How Does This Standard Apply to Me? (§§ 1910.905–1910.910)

OSHA's proposed ergonomics program standard has several unique features. First, it is a job-based standard. As the preamble sections for 1910.901 through 1910.904 of the proposed standard make clear, the standard applies to general industry employers whose employees: (1) Work in manual handling jobs; (2) work in manufacturing jobs; and (3) work in other general industry jobs and experience a musculoskeletal disorder (MSD) that is covered by this standard. Second, employers within the scope of the standard are required only to implement the ergonomics program required by the standard for those jobs specifically listed above; they are not required to have a program for all of the jobs in their workplace. Third, the requirements of the standard apply differently to different general industry employers, because the standard is also risk based. That is, for employers whose employees perform manual handling or manufacturing jobs—jobs which together account for a disproportionate share (60%) of all reported work-related MSDs—employers are required to implement only those elements of the proposed standard that will prepare them to deal with a covered MSD should one occur. Thus, employers whose employees work in these high-risk jobs must put several of the required program elements in place even *before* their employees experience a covered MSD, because the likelihood that they will do so is great. If an employee in a manual handling or manufacturing job subsequently experiences a covered MSD, the employer would then be required to implement the remaining elements of the ergonomics program required by the standard, including job hazard analysis and control, MSD management, training, and program evaluation.

For general industry employers without manual handling or manufacturing jobs in their workplace, however, the proposed standard would not require action until an employee actually experiences such an MSD. In other words, for general industry employers with other types of jobs, the event that ''triggers'' coverage by the standard is the occurrence of an MSD that the employer determines to be covered. As explained above in the summary and explanation for sections 1910.901 through 1910.904, such an MSD could occur in any general industry job, *e.g.*, grocery store cashier, newspaper reporter, secretary, cafeteria worker, restaurant server, computer programmer, mail sorter, janitor, etc. Relying on the occurrence of a covered MSD to trigger the standard's coverage for non-manual handling, non-manufacturing jobs is consistent with the risk-based design of the standard: The occurrence of an MSD that is determined by the employer to be, first, an OSHA-recordable MSD, second, an MSD that has occurred in a job in which the physical work activities are reasonably likely to cause or contribute to the type of MSDs reported, and third, an MSD that has occurred in a job where the physical work activities and conditions are a core element of the job and/or make up a significant amount of the employee's worktime. The scope provisions of the standard (sections 1910.901 through 1910.904) also indicate that employers whose employees engage in construction, agricultural, or maritime operations are not covered by the scope of the rule.

Sections 1910.905 through 1910.910 of the proposed standard, titled ''How does this standard apply to me?,'' determine how various elements of the proposal would apply to these three different groups of general industry employers, depending on the jobs their employees perform and/or whether their employees experience a musculoskeletal disorder that is covered by the standard. These sections of the proposal thus contain the internal ''action levels'' or ''triggers'' that OSHA has built into the standard to tailor its requirements to the extent of the ergonomics problem present in a given workplace.

Specifically, these sections of the proposal contain the following requirements:

- Section 1910.905 describes the elements of a complete ergonomics program;
- Section 1910.906 establishes the requirements of the program that apply to all general industry employers that have manual handling or manufacturing production jobs in their workplaces;
- Section 1910.907 sets forth the requirements of the rule applying to general industry employers whose employees experience a covered MSD in jobs other than manual handling or manufacturing;
- Section 1910.908 establishes the criteria general industry employers wishing to avail themselves of the proposed standard's ''grandfather'' clause must meet in order to qualify for grandfather status;
- Section 1910.909 provides general industry employers with a Quick Fix option, which would allow them to avoid setting up an ergonomics program for any problem job that they can fix completely within a short period of time, provided that they also meet the other requirements delineated in this section; and
- Section 1910.910 specifies the requirements applying to employers whose Quick Fix controls have not eliminated MSD hazards in the problem jobs they tried to address through the Quick Fix option.

The following paragraphs explain OSHA's rationale for each of these sections of the proposed rule.

Section 1910.905 What are the elements of a complete ergonomics program?

In this standard, a full ergonomics program consists of these six program elements:

- Management Leadership and Employee Participation;
- Hazard Information and Reporting;
- Job Hazard Analysis and Control;
- Training;
- MSD Management; and
- Program Evaluation.

OSHA is proposing in this standard that employers implement an ergonomics program that contains well-recognized program elements. OSHA is not alone in believing that all of these core elements are essential to the effective functioning of ergonomics programs. Many private sector companies, OSHA stakeholders, insurers, employee and employer associations, safety and health professionals, and other Federal agencies (*e.g.*, NIOSH, GAO) have endorsed these elements as key to ergonomic program effectiveness. Evidence of the widespread acceptance of these program elements and their effectiveness is reflected in the following documents, regulatory actions, and sources of expert opinion: [1]

[1] There is no provision for WRP in the OSHA safety and health program guidelines, state safety and health programs, nor the ASSE program; of these, the OSHA guidelines and ASSE program are voluntary.

• They track OSHA's 1989 voluntary *Safety and Health Program Management Guidelines* (54 FR 3904), which were well received and widely adopted by employers and other stakeholders;

• State safety and health program regulations, most of which address ergonomic issues. Of the 32 states that encourage or mandate workplace safety and health programs, 21 have provisions corresponding to the core elements in this proposal;

• OSHA's Ergonomics Program Management Guidelines for Meatpacking Plants (Ex. 2–13), which includes all of these core elements. Facilities that have developed programs based on the meatpacking guidelines have experienced dramatic reductions in the severity and number of MSDs (Ex. 26–1420);

• Consensus among occupational safety and health professionals that these are the elements needed in an effective safety and health program. (see, *e.g.*, the American Society of Safety Engineers Safety and Health Program Manual). The core elements in this proposal are also similar to the components in the approach used by the Accredited Standards Committee in developing the draft consensus standard, ''Control of Cumulative Trauma Disorders'' for the American National Standards Institute (Z–365);

• A study by the General Accounting Office of ergonomics programs, which found that effective programs include the same set of core elements as OSHA has proposed; and

• The 1997 NIOSH document titled ''Element of Ergonomics Programs,'' which outlines the ''approach most commonly recommended for identifying and correcting ergonomic problems.'' Thus, OSHA finds that these elements are the ones needed for an effective ergonomics program and represent the tried and true mainstream approach to ergonomic programs.

The core elements in this proposal will allow employers to manage all aspects of the process of protecting workers from MSDs and are a way of organizing that process into parts that can be meaningfully understood and implemented. All of the elements are important, although many safety and health professionals believe that management leadership and employee participation are the keystone of an effective ergonomics program (OSHA/NIOSH conference 1997). OSHA believes that all of the elements are necessary to achieve the overall goal of managing MSDs and ensuring that MSD hazards are systematically and routinely prevented, eliminated, or controlled.

Many OSHA stakeholders and respondents to the ergonomics ANPR published in 1992 (57 FR 34192) have endorsed the program approach. For example, the M & M Protection Center (Ex. 3–51) stated: ''Generic components described in the ANPR and in the Meat Packing Guidelines are feasible and necessary elements of an ergonomic hazards control strategy. These form a practical foundation from which to build a more industry-specific program.''

Another commenter, Arvin Industries, Inc. (Ex. 3–46) emphasized the value of the program approach to companies engaged in different businesses:

> The use of the * * * [program] approach has been shown to provide effective solutions and a significant reduction in ergonomics hazards in jobs in many different industries.

Employees, represented by the AFL–CIO (Ex. 3–184), urged OSHA to include all of the program elements in the Meatpacking Guidelines in any future ergonomics standard:

> The AFL–CIO strongly supports the inclusion of the listed elements in OSHA's proposed ergonomics standard.

OSHA has been responsive to these commenters by including the six core elements listed above in the ergonomics program required by the proposed standard for jobs where the hazards present are such as to pose a reasonable likelihood of lending to a covered MSD, or have already caused or contributed to such an MSD.

The summary and explanation sections of the preamble for each program element describe OSHA's reasoning for including each element in the proposed program.

Section 1910.906 How does this standard apply to manufacturing and manual handling jobs?

You must:

a. Implement the first two elements of the ergonomics program (Management Leadership and Employee Participation, and Hazard Information and Reporting) even if no MSD has occurred in those jobs.

b. Implement the other program elements when either of the following occurs in those jobs (unless you eliminate MSD hazards using the Quick Fix option in section 1910.909):

1. A covered MSD is reported; or

2. Persistent MSD symptoms are reported plus:

i. You have knowledge that an MSD hazard exists in the job;

ii. Physical work activities and conditions in the job are reasonably likely to cause or contribute to the type of MSD symptoms reported; and

iii. These activities and conditions are a core element of the job and/or make up a significant amount of the employer's worktime.

Note To § 1910.906: ''Covered MSD'' refers to MSDs that meet the criteria in § 1910.901(c). As it applies to manufacturing and manual handling jobs, ''covered MSDs'' also refers to persistent symptoms that meet the criteria of this section.

This section of the rule sets out the requirements applying to general industry employers whose employees perform the high-risk jobs of manual handling or product manufacturing. As discussed in the Risk Assessment and Benefits chapter of the preamble and Preliminary Economic Analysis, respectively, these two jobs account for 60% of all reported general industry MSDs but employ only 28% of all general industry employees. Section 1910.901(a) defines manufacturing jobs as production jobs in which employees perform the physical work activities of producing a product and in which these activities make up a significant amount of their worktime, and section 1910.902(b) defines manual handling jobs as those in which employees perform forceful lifting/lowering, pushing/pulling, or carrying and in which such forceful manual handling is a core element of the employee's job.

Examples of jobs that are typically manufacturing jobs include assembly line jobs, product inspection jobs, and jobs involving machine operation, meat packing, and tire building, among others. Examples of manual handling jobs are those involving patient handling, baggage handling, grocery store stocking, garbage collecting, and janitorial work, among others. Examples of other jobs that would typically be considered manual handling or manufacturing jobs, and examples of those that would not be so classified, can be found in proposed section 1910.945, Definitions.

Paragraphs (a) and (b) of section 1910.906 mandate that employers whose operations involve manual handling or manufacturing jobs, as defined by the proposed standard, implement the first two elements of the ergonomics program required by the standard in these jobs. These elements are:

(1) Management leadership and employee participation, and (2) hazard information and reporting. Each general industry employer whose operations involve either or both of these types of jobs would be required to implement these two program elements in these jobs within one year of the standard's effective date (see proposed section 1910.942). Compliance with these two elements is required even if no employee in these jobs has experienced a covered MSD. As discussed above, OSHA is requiring that these basic elements of an ergonomics program be in place in these jobs because of the high-risk nature of the physical work activities associated with these jobs. Having these elements in place ensures that employers and employees are informed and aware of MSD hazards and the signs and symptoms of MSDs and have established the management structure and employee participation mechanisms necessary to respond quickly if the need arises.

This section of the proposal also requires employers with manual handling or manufacturing jobs to comply with the other elements of an ergonomics program, including MSD management, job hazard analysis and control, training, and program evaluation, if an employee in a manual handling or manufacturing job experiences an MSD that the employer determines, in accordance with proposed sections 1910.901 (c) and 1910.902, to be covered by the proposed standard. As explained in the summary and explanation for those sections, a covered MSD, as defined by this standard, is one that occurs after the effective date of the standard, is an OSHA-recordable MSD (as defined by OSHA's recordkeeping rule, 29 CFR part 1904), and is determined by the employer to have occurred in a job in which the physical work activities and conditions are reasonably likely to have caused or contributed to the type of MSD reported, or to have aggravated a pre-existing MSD. For manufacturing or manual handling jobs, it is important to note that covered MSDs also include: (1) Reports by employees of persistent symptoms of MSDs (persistent is defined as lasting for 7 consecutive days), (2) where the employer has knowledge that such jobs pose MSD hazards to employees, (3) where the job is one in which the physical work activities and conditions of the job are reasonably likely to cause or contribute to the type of MSD reported, and (4) where the activities and conditions are a core element of the job and/or make up a significant amount of the employee's worktime. By ''have knowledge,'' OSHA means that the employer has been provided with information that MSD hazards exist in that job by personnel from an insurance company, or by a consultant, a health care professional, or a person working for the employer who has the requisite training to identify and analyze MSD hazards. Inclusion of this action trigger in the proposed standard is consistent with OSHA's risk-based approach, because the occurrence of persistent symptoms, such as constant pain, tingling, or numbness, coupled with information from a knowledgeable source that the employee's job is one that poses an ergonomic hazard, is strong evidence that the job is one that is reasonably likely to cause or contribute to a covered MSD. OSHA believes that employers generally accept and rely on information from these sources because they are perceived of as unbiased, knowledgeable, and aware of conditions in the employer's specific workplace.

Section 1910.906 of the proposal would allow employers whose work involves manufacturing or manual handling operations to limit their ergonomics program for those jobs to two elements, management commitment/employee participation, and hazard information and reporting, until a problem job (*i.e.*, one held by an employee who has experienced a covered MSD, or a job in the workplace that has the same physical activities and conditions as the job held by such an employee) has been identified. If no covered MSD occurs in the manufacturing or manual handling job, the employer is not required to implement the other elements of the program.

By requiring employers whose employees work in manual handling or manufacturing jobs to implement the first two elements of an ergonomics program even before a covered MSD occurs among the employees in that job, OSHA is requiring these employers to establish a basic surveillance system for MSDs. This basic system consists, under the management leadership element, of assigning responsibilities for the ergonomics program to managers, supervisors, and employees so that these individuals know what their role in the program is, providing these individuals with the information, resources, information and training they need to carry out these responsibilities effectively, and communicating with employers on a regular basis about the program and their concerns about ergonomics issues. In addition, the employer must, as part of management leadership, make sure that its existing policies and procedures do not discourage employee reporting of MSDs or participation in the program. By following these requirements, employers will have established the management process necessary to a functioning ergonomics program: management at the workplace will have a basic system in place to ensure that employee concerns about MSDs are being expressed and responded to, program responsibilities are understood, resources have been made available to the program, and no barriers stand in the way of early and full employee reporting.

The employee participation component of this first program element is the other side of the basic surveillance system the standard requires employers with these two kinds of high-risk jobs to implement. To comply with the employee participation provisions of the standard, employers must set up a way for employees and their designated representatives to report MSD signs and symptoms to the employer, receive prompt responses to these reports, have access to a copy of the ergonomics standard (either through posting or by providing hand copies to employees) and to information about the employer's ergonomics program, and ways to participate in the development, implementation, and evaluation of the ergonomics program.

By implementing these provisions, the second half of the first program element will be put in place: employees will know how to report MSDs and their signs and symptoms, they will expect to receive responses to those reports from management, they will understand their employers' ergonomics program, and they will know how they can participate effectively in making the program a success.

Section 1910.906 also requires, at paragraph (b), that employers with these jobs comply with all of the other elements of an ergonomics program—job hazard analysis and control, MSD management, training, and program evaluation—if a covered MSD occurs in a manual handling or manufacturing job. (As discussed above, for these jobs, persistent MSD symptoms are considered covered MSDs if they also meet the criteria specified in paragraph (b)(2) of this section.) There is one exception to compliance with paragraph (b) of this section: employers who choose the proposed rule's Quick Fix option (described below) do not have to implement the other program elements.

Section 1910.907 How does this standard apply to other jobs in general industry?

In other jobs in general industry, you must comply with all of the program elements in the standard when a covered MSD is reported (unless you eliminate the MSD hazards using the Quick Fix option).

As discussed earlier in this section of the preamble, employers with other jobs (*i.e.*, jobs that do *not* involve either manufacturing or manual handling) are not required by the proposed rule to take any action until and unless a covered MSD occurs in such a job. Thus, for most employers in general industry in a given year, no action is required by the standard. However, if a covered MSD occurs in one of these ''other'' jobs, it becomes a ''problem job,'' as defined in the standard, and the full ergonomics program must be implemented for that job and all jobs in the workplace that involve the same physical work activities.

OSHA has included section 1910.907 in the proposed standard to provide employees who have experienced a covered MSD in these other jobs with the same program protections afforded to manual handling and manufacturing employees who have suffered a covered MSD.

Section 1910.908 How does this standard apply if I already have an ergonomics program?

If you already have an ergonomics program for the jobs this standard covers, you may continue that program, even if it differs from the one this standard requires, provided you show that:

a. Your program satisfies the basic obligation section of each program element in this standard, and you are in compliance with the recordkeeping requirements of this standard (§§ 1910.939 and 1910.940);

b. You have implemented and evaluated your program and controls before [the effective date]; and

c. The evaluation indicates that the elements are functioning properly and that you are in compliance with the control requirements in § 1910.921.

This section of the proposed standard is a limited grandfather clause that is designed to permit employers who have already implemented and evaluated an ergonomics program in those jobs covered by the standard to continue their program, if: it has been shown to eliminate or materially reduce MSD hazards according to § 1910.921, it has the core elements of the program OSHA is requiring, and it meets the basic obligation of each of the core elements in the proposed rule.

By requiring that grandfathered programs meet the conditions set out in paragraphs (a) through (c) of section 1910.908, OSHA is affirming the importance of each of the core elements, as well as recordkeeping, to the proper functioning of an effective ergonomics program. OSHA is also emphasizing the importance the Agency places on the basic obligation sections of the proposed standard (sections 1910.911, 1910.914, 1910.917, 1910.923, 1910.929, and 1910.936). These sections establish the basic requirements employers must follow to implement each core element but do so in less detail than the implementing requirements that follow the basic obligation section for each core element. OSHA believes that the requirements identified in the basic obligations sections of the proposal are the minimum requirements needed to effectively implement the core element to which they pertain. In other words, although OSHA is proposing to grant grandfather status to effective ergonomics programs, it believes that the requirements set forth in each basic obligation section must be present in an ergonomics program for that element to be effective. Thus, employers whose existing programs meet the conditions of the limited grandfather clause in section 1910.908 are free not to implement the more detailed provisions that follow the basic obligation section, provided that they comply fully with the basic obligation section's provisions.

OSHA has several reasons for including the standard's core elements in any ergonomics program that is grandfathered in under the standard. OSHA's reasoning is discussed below.

First, except for WRP, the core elements (management leadership and employee participation, hazard identification and assessment, hazard prevention and control, MSD management, training, and evaluation) are included in the safety and health programs recommended or used by many different organizations (the ergonomics standard uses slightly different terminology for some of these elements):

- OSHA's VPP, SHARP, and consultation programs;
- The safety and health programs mandated by 18 states;
- The safety and health programs recommended by insurance companies for their insureds (many of which give premium discounts for companies that implement these programs or impose surcharges on those that do not);
- The safety and health programs recommended by the National Federation of Independent Business, the Synthetic Organic Chemical Manufacturers Association, the Chemical Manufacturers Association, the American Society of Safety Engineers, and many others;
- The strong recommendations of OSHA's Advisory Committees (NACOSH, ACCSH, and MACOSH), which consider these program elements essential to effective worker protection programs.

Second, OSHA believes, and most stakeholders agree, that enforcement of the standard will be more consistent and more equitable, as well as less time-consuming, for employers and compliance officers alike, if the test of an employer's program is whether the program contains the core elements, rather than whether it is effective. The term effectiveness is subject to many different interpretations. Effectiveness can be measured in many different ways (*e.g.*, decreases in the number of MSDs, decreases in the severity of MSDs, increases in product quality, decreases in insurance premiums, decreases in the number of claims, decreases in turnover, decreases in absenteeism, increases in productivity, increases in the number of MSDs reported early, etc.), several of which have built-in incentives to discourage reporting of MSDs (as discussed in the Significance of Risk (Section VII) section of the preamble, underreporting of MSDs is already extensive. In addition, there are no data that would allow OSHA to evaluate or to choose among these various effectiveness measures. OSHA solicits comments on measures of program effectiveness that are not susceptible to underreporting and that can be used reliably and simply by establishments of all sizes. For example, are there measures of effectiveness that OSHA could use as a measure of effectiveness when determining whether to allow a program to be grandfathered in?

In addition, evaluating programs using the core elements test is administratively simpler, both for OSHA personnel and employers. The Agency is in the process of validating a measurement tool for compliance officers and employers to use in assessing the effectiveness of ergonomics programs. This tool, which is based on the consultation program's Form 33, has been tested for face validity and is being tested for construct validity at the present time; OSHA intends to disseminate it to employers, so that both OSHA personnel and employers will be operating from the same ''sheet of music.'' OSHA believes that use of a tool based on the core

elements rather than on unproven measures of effectiveness will thus benefit OSHA, workers, and their employers.

OSHA is including WRP, or equivalent protections against wage loss, as a requirement for all programs because, without it, OSHA believes that there will be increased pressure on employees not to report once an enforceable standard is in place. There is strong evidence that such underreporting is currently taking place (see the table summarizing the many articles on this topic in Section VII of the preamble), as well as evidence that protecting workers from wage loss increases reporting (the Krueger studies). OSHA's purpose in proposing a WRP provision in this standard is to ensure employee participation and free and full reporting of MSDs and MSD hazards. The ergonomics standard depends, more heavily than any OSHA health standard promulgated to date, on employee reporting for its effectiveness. Absent such reporting, the standard will not achieve its worker protection goals. The success of the standard, like that of the many effective ergonomics programs our stakeholders have told us about, depends on it.

The proposed grandfather clause is also limited in its applicability to programs that are in place and have been evaluated and found to be working properly by the effective date of the standard. OSHA believes that this provision is appropriate because it will encourage employers to be proactive and establish programs to protect their employees before the effective date. It will require these programs to have been evaluated before they qualify for grandfather status, which will avoid a last minute rush to implement programs before the effective date and ensure that those programs allowed under the grandfather clause are mature, fully functioning programs. It will also avoid the administrative and compliance problems that would arise if OSHA permitted employers to establish ergonomics programs that differ from the one in the standard even after the effective date.

OSHA seeks comment on all aspects of the grandfather clause provisions, particularly on the protectiveness and appropriateness of including such a provision in a final standard.

Section 1910.909 May I do a Quick Fix instead of setting up a full ergonomics program?

Yes. A Quick Fix is a way to fix a problem job quickly and completely. If you eliminate MSD hazards using a Quick Fix, you do not have to set up the full ergonomics program this standard requires. You must do the following when you Quick Fix a problem job:

(a) Promptly make available the MSD management this standard requires;

(b) Consult with employee(s) in the problem job about the physical work activities or conditions of the job they associate with the difficulties, observe the employee(s) performing the job to identify whether any risk factors are present, and ask employee(s) for recommendations for eliminating the MSD hazard;

(c) Put in Quick Fix controls within 90 days after the covered MSD is identified, and check the job within the next 30 days to determine whether the controls have eliminated the hazard;

(d) Keep a record of the Quick Fix controls; and

(e) Provide the hazard information this standard requires to employee(s) in the problem job within the 90-day period.

Note to § 1910.909: If you show that the MSD hazards only pose a risk to the employee with the covered MSD, you may limit the Quick Fix to that individual employee's job.

OSHA is permitting employers who meet all the requirements of this section to refrain from setting up the full ergonomics program otherwise required. For example, employers can avoid the training and program requirements of the standard if they can eliminate the MSD hazard in the problem job (including other jobs meeting the ''same job'' definition in the standard) quickly.

The Quick Fix option is designed for those problem jobs where the hazard can be readily identified, the solution is obvious, and the solution can be implemented within 90 days after the covered MSD is identified. OSHA has heard repeatedly from stakeholders and others that a large number of jobs will fall into this category. The proposed Quick Fix process differs from the job hazard analysis and control process described in sections 1910.917 through 1910.922, which is appropriate for MSD hazards and jobs requiring iterative changes or extensive analysis to resolve.

The proposed rule requires that employees in problem jobs receive MSD management, including work restriction protection, for their injuries without regard to whether the job is controlled using the Quick Fix option or the full job hazard analysis and control approach. In addition, employee(s) in problem jobs that are fixed through the Quick Fix process must be involved in the Quick Fix process, just as they are involved in the full job hazard analysis and control process. In other words, employers choosing the Quick Fix option must demonstrate management leadership and implement employee participation for the problem job, but would not have to continue these elements after the job is fixed (unless they are employers with manual handling or manufacturing jobs).

The Quick Fix controls must be implemented within 90 days to qualify for this option. OSHA believes that this period is sufficient for employers to identify appropriate engineering controls, to eliminate the MSD hazards entirely, and to order and implement those controls. Again, this time period is consistent with the principal concept behind Quick Fix: that the problem job be fixed quickly, simply and completely. Examples of Quick Fixes include purchasing an adjustable VDT workstation, placing a box under the work surface of an employee who must bend down to see the work, and tilting the work surface toward the employee to prevent long reaches.

As stated in paragraph (b) of this section, if the employer can demonstrate that the MSD hazard that caused or contributed to the MSD only poses a risk to the particular employee with the MSD, the employer may limit the Quick Fix to that individual employee's job. In other words, in this limited case, the employer would not be required to fix the jobs of others in the problem job, because the hazard is one unique to the employee rather than the job. For example, a very tall employee might only need to have the work surface raised, and a very small employee might only need to have the work surface repositioned closer to his or her body.

Paragraph (c) of section 1910.109 requires employers using the Quick Fix option to evaluate the controls within 30 days to be sure that they have eliminated the hazard. One of the best ways to determine whether the Quick Fix has worked is to ask the injured employee. Employers typically can tell almost immediately that the MSD hazard has been eliminated; however, it may take a week or two for the symptoms to resolve.

NIOSH recommends that employers wait a minimum of two weeks before evaluating control effectiveness, because employees need time to acclimate to the changes. NIOSH

also recommends, and the proposed standard would require, that employers not wait longer than 30 days to evaluate controls, to enable changes to be made if they are not working.

Paragraph (d) of section 1910.909 requires employers who avail themselves of this option to keep records of the Quick Fix controls they implement. This means that employers must document the controls they have implemented, when they are implemented, and the results of the 30-day evaluation. These records are essential to document the employer's choice of this option and to support the employer's decision not to implement the other components of the ergonomics program.

Section 1910.910 What must I do if the Quick Fix does not work?

You must set up the complete ergonomics program if either of these occurs:

(a) The Quick Fix controls do not eliminate the MSD hazards within the Quick Fix deadline (within 120 days after the covered MSD is identified); or

(b) Another covered MSD is reported in that job within 36 months.

Exception: If a second covered MSD occurs in that job resulting from different physical work activities and conditions, you may use the Quick Fix a second time.

This section requires employers who have chosen the Quick Fix option but have not been successful in eliminating the MSD hazards in the job to implement the full ergonomics program. The employer must implement the full ergonomics program for a job either where the Quick Fix fails to eliminate MSD hazards within 120 days, or if another covered MSD occurs in that job within 36 months after implementing the Quick Fix.

This paragraph of the proposed standard contains an exception: where an employer has implemented a Quick Fix in a job and another covered MSD occurs in that job, the employer may may use the Quick Fix approach a second time if the second covered MSD is one caused or contributed to by work activities that are different from those that caused or contributed to the first covered MSD in that job. The exception to section 1910.910 would apply when, for example, a particular job requires the employee to perform a manufacturing assembly or data entry job for a significant amount of their worktime and also to perform forceful lifting as a core element of the job. In such a situation, an employee in that job could experience a case of carpal tunnel syndrome, and the employer could use a Quick Fix to control the MSD hazard. If any employee in the same job subsequently (*e.g.*, 2 years later) develops a lower back injury, the exception to section 1910.910 would permit the employer to use a Quick Fix to address the manual handling hazard. However, the proposed standard would only permit the Quick Fix option to be used twice in the same job because, if covered MSDs continue to occur in the same job, job hazard analysis and control, as well as the other provisions of the full program, must be implemented.

Evidence of the failure of the Quick Fix approach could take two forms: the evaluation performed within 30 days of the implementation of the Quick Fix reveals that the control has not eliminated the hazard (*e.g.*, the employee reports that his/her signs or symptoms have worsened) or an employee in that job suffers a covered MSD to which the exception does not apply. Where the Quick Fix option has failed, the employer would be required to move into the full program, *i.e.*, job hazard analysis and control, training, and program evaluation.

Management Leadership and Employee Participation (§§ 1910.911–1910.913)

Sections 1910.911–913 of the proposed standard describe and explain the proposed requirements for the management leadership and employee participation element of the Ergonomics Program standard. These two program components are critical to the successful implementation of an ergonomics program in any workplace. The importance of management leadership is well-recognized (Exs. 26-17; 26–10; 26–27; 26–22; 26–18; 26–13; 26–14). Likewise, the importance of employee participation in ergonomics program success is also well-documented (Exs. 26–30; 26–17; 26–4; 26–21; 26–19; 26–10; 26–15; 26–16; 26–20; 26–27; 26–22; 26–11; 26–12; 26-18; 26–13; 26–14).

Management leadership and employee participation are complementary (Exs. 2–12; 2–13). Management leadership and commitment provides the motivating force and the resources for organizing and controlling activities within an organization (Ex. 2–12). In effective ergonomics programs, management regards the protection of employee health and safety as a fundamental value of the organization, and incorporates objectives for the success of this program into its broader company goals (Ex. 2–12). Employee participation provides the means through which workers develop and express their own commitment to safe and healthful work, as well as sharing in the overall success of the company (Ex. 2–12).

OSHA has decided to include a management leadership component in its proposed Ergonomics Program standard because the importance of management leadership has been emphasized throughout the literature on ergonomics programs (Exs. 2–13; 26–2; 26–5; 26–9; 26–17; 26–10; 26–27; 26–22; 26–18; 26–13; 26–14). For example, OSHA's Ergonomics Program Management Guidelines for Meatpacking Plants (''Meatpacking Guidelines'') states that an ''effective ergonomics program includes a commitment by the employer to provide the visible involvement of top management, so that all employees, from management to line workers, fully understand that management has a serious commitment to the program'' (Ex. 2–13, p. 2). NIOSH also emphasizes management commitment in its primer, Elements of Ergonomics Programs (Ex. 26–2). According to NIOSH, the ''occupational safety and health literature stresses management commitment as a key and perhaps controlling factor in determining whether any worksite hazard control effort will be successful'' (Ex. 26–2, p. 6). Adams (Ex. 26–9, p. 182) states simply that ''to launch an ergonomics process, management support is key.'' In its report titled, ''Worker Protection: Private Sector Ergonomics Programs Yield Positive Results,'' the Government Accounting Office (GAO) also found management commitment to be a key component for program success (Ex. 26–5). The GAO found that ''management commitment demonstrates the employer's belief that ergonomic efforts are essential to a safe and healthy work environment for all employees' (Ex. 26–5, letter:3.1).

In response to questions raised in OSHA's Advance Notice of Proposed Rulemaking (ANPR) (Ex. 1), a number of comments were received that addressed the issue of management commitment for a successful ergonomics program (Exs. 3-136; 3–173; 3–124; 3–27). For example, the American Automobile Manufacturers Association stated that an ergonomics program should incorporate ''employer commitment in writing to health and safety,'' and that management commitment is an ''essential part of any

successful program'' (Ex. 3–173, p. 2). Ms. Anne Tramposh, Vice President of Advantage Health Systems, Inc., also wrote of the importance of management commitment (Ex. 3–124, p. 5). She stated:

> At the risk of over-generalizing this issue, we have found that companies lacking management commitment will not truly implement the comprehensive multi-disciplinary program approach that is needed to address the ''Ergonomic Disorders'' problem. These companies tend to look for band-aids, not solutions.
>
> On the other hand, companies with strong top management commitment, that literally cringe at [the] thought that they may be injuring their employees, will seek the root causes of the problem. They will dedicate financial and personnel resources to the program. They will not quit when the ''going gets tough'' and more employees are reporting injuries (at the beginning of a program).
>
> Any standard or regulation for this problem must ensure top management commitment. The Ergonomic Disorder problem will not go away without it.

Another statement of support for management commitment was provided by Mr. Stephen Rohrer, Section Head, EG&G Energy Measurements, Inc. (Ex. 3–27). In explaining the ergonomics program at his company, Mr. Rohrer stated, ''[O]ne of the key components of the program was obtaining upper management support for ergonomics. This was accomplished by a policy statement placing ergonomics at the same level of importance as the company's production processes' (Ex. 3–27, p. 2).

OSHA believes that employee participation is as important for program success as management leadership. OSHA's Meatpacking Guidelines (Ex. 2–13) recommend employee involvement as essential to the identification of existing and potential hazards and the development and implementation of effective hazard abatement. NIOSH found that promoting employee participation to improve workplace conditions has several benefits, including: enhanced worker motivation and job satisfaction; added problem-solving capabilities; greater acceptance of change; and greater knowledge of the work and organization (Exs. 26–2; 26–4). Employee participation also helps to secure employee buy-in to the ergonomics program.

Section 8 of the OSH Act also recognizes the value of employee involvement in workplace safety and health. For example, this section of the Act spells out specific requirements for employee involvement in the observation of employee monitoring to identify employee exposure to workplace hazards, obtaining and reviewing records, receiving information, and reporting hazards.

Active employee participation is especially important in the proposed Ergonomics Program standard because this standard, more than most OSHA standards, depends for its effectiveness on the voluntary reporting of MSD signs and symptoms by employees. To ensure that employees voluntarily participate when the signs and symptoms of MSDs first arise, OSHA believes they must be active participants in program development, implementation, and evaluation, and must be sure that they will not be discriminated against for such participation (see the discussion of proposed section 1910.911 below). Also, when it came to the issue of employee participation, many of OSHA's stakeholders said that this element is essential to program success (Exs. 26–23; 26–24).

Additionally, OSHA received many comments in response to its ANPR that support the idea of employee participation in ergonomics programs (Exs. 3–27; 3–66; 3–94; 3–96; 3–98; 3–124; 3–136; 3–155; 3–173). For example, Mr. James Torgerson, Director-Corporate Safety, Sara Lee Corporation, stated (Ex. 3–66, p. 4):

> Further, it is our belief that employee involvement in the development and implementation of a company's ergonomic program is desirable for both the company and for the employees. We believe that employers should be encouraged to consider where employee involvement can best be utilized in their individual program. For example, employees can be used as a resource to assist in identifying and resolving ergonomic problems. Mandatory joint labor/management committees, however, should not be part of the standard.

Dr. Tom Leamon, Vice President, Liberty Mutual Insurance Company, also commented on the need for an employee participation requirement (Ex. 3–96). He stated, ''[t]he effectiveness of regulations would be enhanced by a provision for worker participation, in particular the identification of potential problems and solutions and providing this information to the management decision process within the unit'' (Ex. 3–96, p. 2).

Additionally, Mr. Steve Trawick, Director, Health and Safety, United Paperworkers International Union and Mr. Daniel Kass, Director of the Hunter College Center for Occupational and Environmental Health, clearly stated their support of employee participation in ergonomics programs. In response to the ANPR, they wrote ''[e]mployee involvement is crucial to the success of the ergonomic program. Workers know jobs in the plant better than anyone and can offer invaluable input in the analysis and decision making process'' (Ex. 3–136, p. 4).

However, OSHA is aware that there is opposition to the inclusion of the management commitment and employee participation provisions in the proposed Ergonomics Program standard. For example, several stakeholders have expressed concern about the implementation and enforceability of the management leadership requirements, asserting that they amount to micro-management of their business. Clearly, OSHA does not intend this proposed program element to be a form of micro-management. Precisely to avoid this unwanted outcome, the requirements for management leadership and employee participation have been proposed in performance oriented language. Thus, employers covered by this standard may manage their leadership of the ergonomics program in whatever ways work best for their workplaces, as long as the basic requirements are satisfied.

Additional opposition to this proposed provision was expressed in a stakeholder meeting held in Washington, DC, when one participant stated that legislation of employer commitment and employee participation is problematic because it is not clear what these provisions require (Ex. 26–23). Other stakeholders have stated that, in their opinion, employee participation is not needed in successful programs (Ex. 26–23). Still others have argued that employee participation, as proposed by OSHA, is in violation of the National Labor Relations Act (NLRA) (Ex. 26–23).

Regarding conflicts with the NLRA, testimony presented by Henry L. Solano, Solicitor of Labor, Department of Labor, before the Subcommittee on Workforce Protections Committee on Education and the Workforce in the House of Representatives on May 13, 1999 (Ex. 26–29), clearly states that ''the interplay of the OSH Act and the National Labor Relations Act (NLRA) does not present an obstacle to progress in this area [of employee participation in promoting a safe and healthful workplace].'' Mr. Solano identified many ways in which employers can involve their employees in safety and health matters without raising any concern that

they may be violating Section 8(a)(2) of the NLRA. OSHA is proposing to require employee participation but not to specify the form that participation is to take. There are several lawful forms of employee participation that have been upheld or described with approval by the National Labor Relations Board (NLRB) in the course of deciding cases under Section 8(a)(2).

According to Mr. Solano (Ex. 26–29, pp. 11–12), brainstorming groups are one such example. A group of employees that brainstorms about MSD hazards, for example, presents management with a list of ideas or suggestions. Management independently considers the ideas and suggestions and may or may not act on them. An information-gathering committee that gathers and presents information to the employer, who may or may not take action based on the information, is also a lawful form of employee participation (Ex. 26–29, p. 12). Granting rights to individual employees, such as rights to report problems and make recommendations is consistent with Section 8(a)(2). Additionally, employers have the option to assign safety-related duties to employees as part of their job description (Ex. 26–29, pp. 12–13, 14). Other forms of employee participation that have been approved by the NLRB include safety conferences and all-employee committees in which all employees participate (Ex. 26–29, pp. 13–14). Although in his testimony Mr. Solano was specifically addressing safety and health programs in general, his discussion of lawful forms of employee participation applies equally to ergonomics programs. Another mechanism is a joint labor-management committee established in compliance with the NLRA by bargaining between the employer and the union representing the employees. Thus, employers complying with the proposed standard's employee participation provisions have many lawful ways of doing so.

OSHA notes that the proposed management leadership provisions of the rule have been written in performance language to allow individual employers to implement them as appropriate to conditions in their workplace. This approach avoids the over specification that some stakeholders were concerned about. On the second point, the importance of employee involvement to program effectiveness, the discussion below makes clear that OSHA, and many stakeholders, safety and health professionals, and ergonomists agree that this element is the key to program success. OSHA has also been careful to structure the proposed rule's employee participation requirements so that they are entirely consonant with the case law based on the NLRA. The proposed rule does not, for example, mandate any particular method—such as employee committees—for ensuring employee participation. This leaves employers free to involve employees in the program in ways that do not violate the NLRA but will further meaningful employee participation.

Section 1910.911 What is my basic obligation?

You must demonstrate management leadership of your ergonomics program. Employees (and their designated representatives) must have ways to report ''MSD signs'' and ''MSD symptoms;'' get responses to reports; and be involved in developing, implementing and evaluating each element of your program. You must not have policies or practices that discourage employees from participating in the program or from reporting MSD signs or symptoms.

Section 1910.911 of the proposed Ergonomics Program standard provides employers with an answer to the question ''What is my basic obligation?'' First, employers would be required to demonstrate management leadership of their ergonomics program. Management leadership is demonstrated through personal concern for employee health and safety, as evidenced by the priority placed on the ergonomics program. OSHA believes that, to be effective, the demonstration of management leadership must be active rather than passive. Leadership that is limited to a ''paper program,'' such as having written policies and procedures neatly packaged in a three-ring binder that sits on a shelf, would not be viewed by OSHA as meeting the intention of this provision. On the other hand, management leadership that is known throughout the organization via active engagement in the ergonomics process, with appropriate follow-through on commitments, would meet OSHA's intention. Employers who comply with the requirements of Section 1910.911 would certainly be fulfilling the leadership portion of the standard. Employers may further demonstrate leadership, if they so choose, by participating in plant walkarounds, holding meetings with employees on ergonomic issues, and monitoring reports on program effectiveness.

Second, proposed section 1910.911 would also obligate employers to create ways for employees, and their designated representatives, to report MSD signs and symptoms, get responses to reports, and be involved in the program. OSHA has vigorously advocated employee participation in workplace safety and health issues for many years and is pleased by the growing recognition of the importance of employee participation by private-sector companies, trade associations, safety and health professionals, and employees themselves. OSHA supports employee participation because employees have the most direct interest in their safety and health on the job, they have an in-depth knowledge of the operations and tasks they conduct at the worksite, they often have excellent ideas on how to solve health and safety problems, and their interest in the program is vital to its success. If employees do not report their injuries and illnesses or recognized job-related hazards, any workplace program intended to promote safety and health will fail.

Congress also recognized the importance of employee participation in safety and health activities when it enacted the Occupational Safety and Health Act in 1970. In section 2 of the Act, titled ''Congressional Findings and Purpose,'' Congress declared that its goal of assuring safe and healthful workplaces was to be achieved by joint employer-employee efforts to reduce hazards and implement effective programs for providing safe and healthful working conditions. Additionally, Congress acknowledged that employers and employees have separate roles and rights connected with the achievement of safe and healthful working conditions. Thus, the Act offers employees opportunities to become involved in setting standards, variance processes, enforcement, and training. To assist employees in exercising these rights, Congress gave employees access to a wide variety of information. Employees were also given rights to file complaints and to participate actively in OSHA inspections, hazard abatement verification, citation contests, and the observation of the monitoring of toxic substances.

The value of employee participation in ergonomics programs has been recognized by other federal agencies. The GAO concluded in 1997 that effective ergonomics programs must include both management commitment and employee involvement as two of the core elements necessary to ensure that ergonomics hazards are identified and controlled to protect workers (Ex. 26–5). According to the GAO (Ex. 26–5), some of the ways in which employee participation can be demonstrated include:

- Creating committees or teams to receive information on ergonomic problem areas, analyze the problems, and make recommendations for corrective action;
- Establishing a procedure to encourage prompt and accurate reporting of signs and symptoms of MSDs by employees so that these symptoms can be evaluated and, if warranted, treated;
- Undertaking campaigns to solicit employee reports of potential problems and suggestions for improving job operations or conditions; and
- Administering periodic surveys to obtain employee reactions to workplace conditions so that employees may point out or confirm problems.

NIOSH also recognizes the benefits of employee involvement in the publication Elements of Ergonomics Programs (Ex. 26–2). According to NIOSH (Ex. 26–2, p. 8) these benefits include:

- Enhanced worker motivation and job satisfaction;
- Added problem-solving capabilities;
- Greater acceptance of change; and
- Greater knowledge of the work and organization.

Further, NIOSH recommends that employees be encouraged to provide input on defining job hazards, controlling job hazards, and how best to implement controls (Ex. 26–2). Forms of employee involvement described by NIOSH (Ex. 26–2, pp. 8–9) include:

- Joint labor-management safety and health committees;
- Department or area work groups; and
- Direct individual employee input.

However, NIOSH clearly states that ''[n]o single form or level of worker involvement fits all situations or meets all needs. Much depends on the nature of the problems to be addressed, the skills and abilities of those involved, and the company's prevailing practices for participative approaches in resolving workplace issues'' (Ex. 26–2, p. 9).

Employee involvement, along with management commitment, is also one of the major elements included in OSHA's Safety and Health Program Management Guidelines, published in January 1989 (54 FR 3904–3916). Issued with strong public support, the guidelines state, ''[e]mployee involvement provides the means through which workers develop and/or express their own commitment to safety and health protection, for themselves and for their fellow workers'' (54 FR 3909). At that time, OSHA stated that ''* * * employee involvement in decisions affecting their safety and health results in better management decisions and more effective protection'' (54 FR 3907). OSHA continues to believe that employee participation plays a crucial role in protecting the safety and health of employees and must be an integral part of any ergonomics program.

A recommendation for employee involvement was included in OSHA's ''Meatpacking Guidelines'' as the complement to management commitment (Ex. 2–13, pp. 2–3). The Guidelines recommended:

> An effective program includes a commitment by the employer to provide for and encourage employee involvement in the ergonomics program and in decisions that affect worker safety and health, including the following:
>
> 1. An employee complaint or suggestion procedure that allows workers to bring their concerns to management and provide feedback without fear of reprisal.
>
> 2. A procedure that encourages prompt and accurate reporting of signs and symptoms of [MSDs] by employees so that they can be evaluated and, if warranted, treated.
>
> 3. Safety and health committees that receive information on ergonomic problem areas, analyze them, and make recommendations for corrective action.
>
> 4. Ergonomic teams or monitors with the required skills to identify and analyze jobs for ergonomic stress and recommend solutions.

Third, section 1910.911 of the proposed standard informs employers that policies or practices that discourage employees from reporting MSD signs or symptoms or from participating in the program would not be allowed. Such actions on the part of the employer would undermine the intention of § 1910.911. As discussed above, OSHA believes that meaningful employee participation in the ergonomics program is essential both to identify existing and potential MSD hazards, and to develop and implement an effective solution to abate these hazards.

In the ANPR, OSHA requested comments related to early reporting of MSD signs or symptoms (question D2), the developing and implementing of ergonomics programs including involvement on the ergonomics team (question A6), and the benefits of an ergonomics program (question A7). In response to this request, OSHA received information that supports the proposed requirements in Section 1910.911. For example, Mr. Rohrer of EG&G Energy Measurements, Inc. commented (Ex. 3–27, p. 3):

> The main benefits of this [ergonomics] program are educating employees and empowering employees to recognized ergonomic problems in their work environment while helping to provide solutions to those problems. The program invites employees to make known work problems without fear of retribution from management, even in a period of size restructuring. One of the program philosophies is quite simple—a problem can't be solved unless it's identified.

Additionally, Mr. John Clark, International Representative, International Union, UAW provided this comment (Ex. 3–155, p. 3):

> The structured participation of workers is needed for several reasons. Complaints of symptoms will not be freely given if workers fear reprisal by management. Workers know their job best and must be brought into the process of redesign. The close relationship of this activity to work standards and productivity issues requires prior understandings and continuing oversight. The program must maintain an emphasis on the prevention of pain and suffering, not a cost benefit calculation, and that requires worker involvement.

Section 1910.912 What must I do to provide management leadership?

> You must:
>
> (a) Assign and communicate responsibilities for setting up and managing the ergonomics program so managers, supervisors and employees know what you expect of them and how you will hold them accountable for meeting those responsibilities;
>
> (b) Provide those persons with the authority, ''resources,'' information and training necessary to meet their responsibilities;
>
> (c) Examine your existing policies and practices to ensure they encourage and do not discourage reporting and participation in the ergonomics program; and (d) Communicate ''periodically'' with employees about the program and their concerns about MSDs.

Proposed section 1910.912 provides employers with answers to the following question: ''What must I do to provide management leadership?'' This section explains four management leadership responsibilities that employers

would have under the proposed ergonomics standard. First, as stated in paragraph (a), employers must assign and communicate responsibilities for setting up and managing the ergonomics program so that managers, supervisors and employees know what is expected of them and how they will be held accountable for meeting those responsibilities. Although proposed paragraph (a) would require that ergonomics program responsibilities be assigned, it does not specify who should be assigned to carry out what responsibility. OSHA believes that the employer is in the best position to decide who should have responsibility for the various parts of the process of implementing an ergonomics program, and the proposal gives the employer great leeway in making these decisions.

The proposed rule also does not describe how safety and health responsibility is to be allocated. In larger workplaces, where responsibilities are described in writing, the allocation might be accomplished through official statements, such as job descriptions or individual annual objectives. In very small worksites, oral instruction would suffice as long as everyone knows who has been assigned what responsibilities. In fact, in all cases, the key factor is that those to whom responsibility has been assigned understand that responsibility and take it seriously.

Individuals with responsibility for the ergonomics program must understand how they will be held accountable for meeting these responsibilities. OSHA has not specified how employers should accomplish this proposed requirement. Again, OSHA believes that employers are in the best position to decide how accountability should be determined and evaluated. Some employers may chose to incorporate accountability measures into performance appraisals. For example, one study reports that supervisor performance evaluations had been modified to include an assessment of whether or not ergonomic problems had been addressed (Ex. 26–28).

Second, as stated in proposed paragraph (b), employers must provide individuals assigned responsibilities in the ergonomics program with the authority, resources, information and training necessary to meet their responsibilities. Providing adequate authority, resources, information and training necessary to carry out program responsibilities demonstrates management leadership. If, for example, an employee is assigned responsibility for evaluating a potential MSD hazard, that employee would need access to relevant information about the job creating the potential hazard, adequate knowledge to competently evaluate the job, sufficient time to evaluate the job, and the authority to recommend changes to the job if it is found to present MSD hazards.

Authority, as used in this provision of the proposed standard, means the delegated ability to take action. Such delegated authority is essential if decisions are to be made in a timely manner and progress is to be made in accomplishing ergonomic program goals. Individuals assigned a particular responsibility under the ergonomics program must have the authority they need to discharge those responsibilities.

Resources, as defined in this proposed standard (see § 1910.945, which contains definitions of key terms), are the provisions necessary to develop, implement and maintain an effective ergonomics program. Resources include money (such as the funds needed to purchase equipment to perform job hazard analysis, develop training materials, and implement controls), personnel and the work time to conduct program responsibilities, such as job hazard analysis or training. The resources needed to meet program responsibilities under this standard will vary with circumstances.

The proposed standard would also require employers to provide individuals with assigned responsibility for the ergonomics program with the information and training they need to meet their responsibilities. For individuals involved in ergonomics program implementation and management, employers would be required to provide information and training so that these individuals understand and know, at a minimum:

- The ergonomics program and their role in it.
- How to identify and analyze MSD hazards.
- How to identify, evaluate, and implement measures to control MSD hazards.
- How to evaluate the effectiveness of ergonomics programs.

Sections 1910.923–928 of the proposed rule provides additional information about proposed requirements for ergonomics program training.

Proposed paragraph (b) is written to allow broad discretion for employers to decide just what authority, resources, information, and training are needed for the specific responsibilities assigned. The employer is, however, required by this paragraph to provide the authority, resources, information and training necessary to discharge the responsibility the employer has assigned.

Problems in fulfilling program responsibilities are often caused by lack of the necessary authority or resources to accomplish those responsibilities. For example, an employee may be assigned the responsibility for evaluating MSD hazards and getting those hazards corrected. However, if the same hazards are found on repeat inspections, it may be that the employee lacked the authority to require correction or that no training or inadequate training in the evaluation of MSD hazards has been provided. In both of these examples, the employer has not provided the authority, resources, information and training necessary for the employee to meet his or her assigned responsibilities.

Third, as stated in proposed paragraph (c), employers would be required to examine their existing policies and practices to ensure that they encourage the reporting of MSD signs and symptoms and do not discourage reporting and participation in the ergonomics program. The intent of this proposed provision is to inform employers that they are prohibited by the proposed rule from taking actions that might undermine or otherwise interfere with the reporting of MSD signs and symptoms or ergonomics program participation by their employees.

OSHA has included this provision in the proposed standard because the Agency believes that such protection is needed to encourage early reporting of the symptoms and signs of MSDs and meaningful employee participation in the ergonomics program. OSHA believes that employees in all workplaces should be encouraged by their employers to report injuries, illnesses, and hazards of all kinds—not just those related to ergonomic issues—because only full and frank reporting allows employers to identify hazards and do something about them. In workplaces where employees are discouraged, either implicitly or explicitly, from participating fully in all aspects of safety and health in the workplace, deaths, injuries, and illnesses will continue to occur, employers will continue to pay high workers' compensation premiums, worker morale will suffer, and product quality will be below par. Encouraging employee

participation, and particularly the reporting of MSD signs and symptoms, is especially important under the proposed ergonomics rule because the success of the program depends on such reporting. That is, the standard is structured so that employee reports of MSD signs and symptoms trigger employer actions.

OSHA is aware that some employers discourage reporting unintentionally, and that this can happen even in workplaces where an ergonomics program has been implemented in good faith. For example, employers may be discouraging full and early reporting if they have:

- A policy that every employee who reports MSD signs or symptoms must rest at home without pay.
- A policy that requires drug testing of every employee who reports an injury.
- A supervisory practice of withholding overtime work for anyone who reports MSD signs or symptoms.
- A policy that prohibits the use of sick leave if an employee is off work because of a work-related injury.

It should be noted that OSHA does not consider that having a drug testing policy is, in and of itself, a violation of the standard. However, if the drug testing policy was applied in a discriminatory way, or had a chilling effect on employees' willingness to report, the Agency would evaluate the situation on a case-by-case basis.

Because the underreporting of occupational illnesses and injuries is a widely recognized problem, and is especially serious in the case of ergonomic injuries and illnesses (see discussion of underreporting in the Significance of Risk section (Section VII of this preamble), the purpose of this proposed provision is to ensure that employees in jobs covered by the standard will not be discouraged from reporting problems to their employers. For example, the use of incentive or award programs that focus on achieving low numbers or rates of reported MSDs may discourage early reporting. Such programs, although sometimes intended to improve employee safety and health, may inadvertently lead to the underreporting of MSD cases and thus actually increase unsafe working conditions. Programs that offer financial rewards, such as individual or group performance bonuses, management promotions, or safety game awards (''safety bingo''), or provide personal recognition of individual employees (''safe employee of the month'') to employees, groups, or supervisors if they achieve a zero or low incidence of reportable injuries or illnesses may put considerable pressure on workers not to report and thus discourage reporting, whether intentionally or unintentionally.

OSHA's objective is that employees feel free to report MSD signs and symptoms as early as possible, because doing so prevents pain and suffering, averts disability, and reduces employer costs. To achieve this objective, all MSDs must be reported so that they can be assessed to determine whether they are covered by the standard. Thus, the Agency's concern is with the proper reporting of MSD injuries and illnesses, not on the design of the employer's incentive program. If such programs have the effect of discouraging reporting or employee participation, however, employers would not be in compliance with this section of the standard. Thus, because these programs have the potential to discourage reporting, employers should take special care to ensure that they do not do so.

In comments submitted to OSHA in response to requests made in the ANPR, Martin Marietta Energy Systems, Inc., among others, stated that incentive programs may pose possible barriers to early reporting (Ex. 3–151). The International Union of Electrical, Salaried, Machine and Furniture Workers urged OSHA to discourage practices that inhibit early reporting, and specifically pointed to the use of safety contests (Ex. 3–183).

OSHA is not prohibiting the use of safety incentive or award programs, and nothing in the proposed rule would do so. However, OSHA is encouraging employers who wish to use such programs to design them to reward safe work practices, such as active participation in the ergonomics program, the identification of MSD hazards in the workplace, and the reporting of the early signs and symptoms of MSDs, rather than to reward employees for having fewer MSDs or lower rates of MSDs. The differences in these two kinds of programs—those that focus on safe work practices and those that stress fewer reported MSDs—is that the former, when coupled with appropriate supervisory feedback to employees, may actually reinforce and encourage the kinds of safe practices and participation that employers need to enhance safety and health, while the latter too often encourage employees not to report.

OSHA would not consider incentive programs to be ''illegal'' under this rule except where they are applied in a discriminatory way or have a chilling effect on employees' willingness to report. OSHA's practice is to evaluate the recordkeeping system, and the accuracy and completeness of reporting, when it inspects facilities. If no underreporting is apparent, OSHA does not inquire about any incentive programs that may be in place at the facility. However, if there does appear to be underreporting, OSHA evaluates the situation further to determine what is contributing to the underreporting. OSHA would not cite the employer under this standard for having an incentive program unless it was discouraging reporting or participation in the program (§ 1910.912 (c)). OSHA would cite employers for failure to record OSHA recordable injuries and illnesses, but such a citation would be for a violation of the recordkeeping rule, not the ergonomics rule.

It is OSHA's experience that incentive or award programs are not needed to motivate employees who are active participants in workplace safety and health programs, such as the ergonomics program proposed by this standard. Employees involved in effective workplace programs already receive feedback from their co-workers, supervisors, and managers on safe work practices, regularly provide such feedback to others, and are ''rewarded'' by being full participants in achieving a safe and healthful workplace.

Likewise, only informed employees can truly participate effectively in a workplace ergonomics program. Employees who have received adequate information and training on ergonomic hazards in their workplace can act as ''another pair of eyes and ears'' for their employers. Informed and trained employees can contribute to a workplace culture that values safety and health.

Fourth, proposed paragraph (d) would require that employers ''communicate 'periodically' with employees about the program and their concerns about MSDs.'' Periodic communication between an employer and his or her employees means a regular, two-way exchange of information in which employees receive information about the employer's ergonomics program and its progress, and the employer receives information about MSDs that is of concern to the employees. Although OSHA does not specify a time period for these communications, the frequency of this exchange of information should accurately reflect the needs of a given workplace. For example, OSHA would expect more frequent communication during the start-up

phase of an ergonomics program, when MSD signs or symptoms are reported, and prior to the implementation of workplace changes. At a minimum, communications must be often and timely enough to ensure that employees have the information necessary to protect themselves from MSDs, and have effective input into the operation of the ergonomics program.

Employers will be able to demonstrate this communication by periodically checking to see whether their employees have accurate information about the process for reporting MSD signs or symptoms. Employees should be able to state the various steps of this process, or at a minimum, the first step in the reporting process. Additionally, employers will be able to inspect the reports themselves (if they are in writing) to determine whether employees are actually reporting MSD signs or symptoms and if they are reporting them early.

Section 1910.913 What ways must employees have to participate in the ergonomics program?

Employees (and their designated representatives) must have:

(a) A way to report MSD signs and symptoms;

(b) Prompt responses to their reports;

(c) Access to this standard and to information about the ergonomics program; and

(d) Ways to be involved in developing, implementing and evaluating each element of the ergonomics program.

Proposed section 1910.913 of the ergonomics program standard informs employers of OSHA's specific requirements for employee participation. It provides an answer to the question, ''What ways must employees have to participate in the ergonomics program?'' Proposed paragraph (a) contains the requirement that employees, and their designated representatives, if the employees are represented by a union or unions, must have a way to report MSD signs and symptoms. This proposed provision requires employers to establish a clear process for reporting MSD signs and symptoms and to make that process known to his or her employees, so that reports are received in a timely and systematized manner. For example, employees must know whom to make reports to. These reporting systems may be either formal or informal, depending on the nature and size of the affected employee population. The intention of this provision is for a means of communication to be available and for employees to know how to have access to the system.

Prompt answers to employee reports are necessary so that employees know that their reports have been received and considered. Paragraph (b) of section 1910.913 of the proposed ergonomics program standard requires that employees and their designated representative(s), where applicable, receive prompt responses to their reports. OSHA believes that a timely and good faith response is essential to reinforce the reporting and information exchange process. Quick responses to employee reports are a way to demonstrate management leadership of the ergonomics program. The requirements in proposed paragraphs (a) and (b) of section 1910.913 are the complements to proposed section 1910.916, which requires employers to identify at least one person to receive and respond promptly to employee reports of MSD signs or symptoms, and to take the action this standard requires.

Proposed paragraph (c) of section 1910.913 states that employees, and their designated representative(s), if applicable, must have ''access to this standard and to information about the ergonomics program.'' Such information includes: the assignment of responsibilities under the program; job hazard analysis results; hazard control plans; and records of reports related to the occurrence of covered MSDs and the identification of MSD hazards; ergonomic program evaluation results; and lists of alternative duty jobs. Additionally, employees must be provided with access to a copy of this Ergonomics Program standard. Employers can comply with this provision by posting a copy of the standard on the bulletin board. OSHA believes that employees must have this information to meaningfully participate in the ergonomics program. However, employee access to information does not include access to confidential or private information the employer may have that is of a personal nature, such as medical records.

Assuring employee access to information related to their safety and health on the job is not unique to this proposed standard. Employers are already obligated to provide employees with access to their exposure and medical records by the requirements set forth in OSHA's standard ''Access to Employee Exposure and Medical Records'' (29 CFR 1910.1020). Additionally, OSHA requires employers covered by the Process Safety Management standard (29 CFR 1910.119) to provide employee access to process hazard analyses and all other information required to be developed under that standard.

Paragraph (d) of section 1910.913 proposes that employees and their designated representatives, if applicable, must have ''ways to be involved in developing, implementing and evaluating each element of the ergonomics program.'' Element of ergonomics program refers to elements that are required by this standard, as listed in proposed section 1910.905. OSHA believes that employees must be involved in these important elements of an ergonomics program in order for the program to be effective. For example, when it comes to job hazard analysis and control, no one knows the job better than the employee(s) who does the job on a regular basis. Employees are also most likely to have valuable input regarding the most effective and inexpensive solutions to MSD hazards related to their jobs.

For example, employees must have input in the development, implementation, and evaluation of ergonomic training programs, where training is required under this standard. Employees themselves are the best advisors regarding effective training program content and level of understanding for sometimes complex training material. Obviously, in workplaces where the primary language of some of the employees to be trained is not English, employees must play a critical role in assuring that the training material is presented in language that is understood by the employees. In many cases, that language will be English, because many workers will have acquired a good understanding of English. The standard intends, however, that the training program content be understood by all employees who are required to receive training.

Employees must also be involved in evaluating the effectiveness of the ergonomics program and the control measures that are implemented. OSHA believes that the employees who perform jobs that have MSD hazards are in the best position to know whether or not the ergonomics program and control measures are effective as implemented or if they need to be modified. To effectively eliminate MSD hazards, employers and employees must form a partnership, with each contributing his or her unique expertise to achieve the goals of the ergonomics program.

The nature, form, and extent of how employers must provide employees with opportunities to participate will vary among workplaces. Each workplace and workforce is different, and what will be effective will vary, depending on such factors as:

- The nature of the MSD hazards;
- The number and type of problem jobs in the workplace;
- Past experience with employee participation programs;
- The presence or absence of a union;
- The general safety and health culture of the workplace;
- Relevant state or local laws; and
- The employer's financial resources.

OSHA proposes to provide great latitude to each employer, in consultation with employees, to find the optimal means for achieving the participation required by this proposed standard in their workplace.

Hazard Information and Reporting (§§ 1910.914–1910.916)

Proposed sections 1910.914–1910.916 would require employers whose employees work in manufacturing or manual handling operations, or in jobs in which a covered MSD has occurred, to provide employees in those jobs with basic information about musculoskeletal disorders (MSDs), including their signs and symptoms and how to recognize them. Some signs and symptoms of MSD problems are obvious, such as trigger finger, while others, such as the early stages of tendinitis, may be more subtle. However, explaining the nature of the problem, the characteristic signs and symptoms, and the importance of early reporting is a necessary component of any ergonomics program.

The proposed requirements in these sections are designed to ensure that employers with high-risk employees, such as those in manual handling and manufacturing jobs, have a system in place that will respond appropriately if a covered MSD is reported. In order for employees to report the first signs or symptoms of an MSD, they must recognize those signs and symptoms and understand the urgency of reporting them to the employer promptly. To achieve this end, the proposed rule requires employers to establish a system that includes an MSD reporting system. These sections also require that employers provide pertinent information to employees in problem jobs; this information must address the signs and symptoms of MSDs and common MSD hazards.

These sections stress the importance of early reporting to ensure that employees with MSD signs or symptoms receive help before serious damage occurs. Additionally, the early reporting of MSDs helps to avoid the development of MSD signs or symptoms in other employees in the workplace in the same job. Receiving reports from employees and reviewing available information is an easy and straightforward way to identify problem jobs. For example, employers who follow up on employee reports of MSD signs or symptoms, such as undue strain, localized fatigue, discomfort, or pain that does not go away after overnight rest will be able to take preventive action at the earliest stages.

OSHA's proposed reporting system is a tool for secondary prevention of MSDs. Its purpose is to identify employees with covered MSDs before they would otherwise seek health care for their signs or symptoms. Thus, by design, the reporting system should be highly sensitive, *i.e.*, identify both those employees who definitely have a covered MSD as well as those who, upon further evaluation, are found not to have a covered MSD. OSHA believes this approach is appropriate because certain requirements of this proposed rule are triggered by the occurrence of a covered MSD. Reporting all signs or symptoms of MSDs will help to ensure that covered MSDs are properly identified.

It is important to note that reporting of all signs or symptoms of MSDs through this system does not mean that all of these cases will turn out, on further investigation, to be OSHA recordable cases. Once an employee reports signs or symptoms of an MSD, his or her case would need to be evaluated for OSHA recordability. If the case is determined to be an OSHA recordable MSD and in addition meets the screening criteria (see § 1910.902), it is a covered MSD as defined by the proposed standard.

The information that employers would be required to provide to employees under these sections is general information about MSDs and common MSD hazards. This information, for example, would not have to be specific about the precise conditions or MSD hazards of a particular job. Job-specific training that results from a job hazard analysis is only required if the requirements in the sections that address training (§§ 1910.9 23–928) are triggered by the occurrence of a covered MSD. Examples of the ''big picture'' information that would be required by section 1910.915 include: general hazards associated with MSDs; what musculoskeletal disorders are and the signs and symptoms they cause; the importance of early reporting of MSD signs and symptoms to full recovery; and information about the systems in place to handle employee reporting of MSD signs and symptoms. The intent of this section is to make employees aware of MSDs and common MSD hazards.

In debates over the OSH Act before its passage, Senator Williams stressed that the hidden nature of harmful physical agents made employee awareness of these hazards critically important to providing them with adequate protection from excessive exposure (Legislative History, at 415). MSD hazards are an example of harmful physical agents. This observation continues to be true today, and is particularly apparent in the case of MSDs, which are widely underreported, in part because neither employers nor employees make the link between workplace risk factors and the signs and symptoms of MSDs.

Section 1910.914 What is my basic obligation?

You must set up a way for employees to report MSD signs and symptoms and to get prompt responses. You must evaluate employee reports of MSD signs and symptoms to determine whether a covered MSD has occurred. You must periodically provide information to employees that explains how to identify and report MSD signs and symptoms.

Proposed section 1910.914 informs employers of what they are required to do to facilitate employee reporting of MSD signs and symptoms. There are three proposed obligations under this section. First, employers would be required to: ''set up a way for employees to report MSD signs and symptoms and to get prompt responses.'' By using the word ''way,'' OSHA has created flexibility for employers to use either formal or informal approaches to establishing a reporting system. Large employers may decide that a formal system of reporting that includes written documentation is appropriate to ensure that nothing falls through the cracks. Employers with fewer than 10 employees, on the other hand, may find that oral reporting systems are adequate. Many employers may already have reporting systems in place that can be adapted to accommodate the requirements of the proposed Ergonomics Program standard. However, regardless of how methods are tailored to meet the needs

of a specific workplace and workforce, the process must be systematic and accessible to all employees.

The MSD signs and symptoms to be reported are defined in the section of this standard that covers key terms (§ 1910.945). Signs of MSDs are defined as ''objective physical findings that an employee may be developing an MSD.'' Examples of signs of MSDs include:

- Decreased range of motion;
- Decreased grip strength;
- Loss of function; and
- Deformity.

Symptoms of MSDs are more subjective physical experiences that an employee may report that indicate he or she may be developing an MSD. Examples of MSD symptoms in the affected body part include:

- Numbness;
- Burning;
- Pain;
- Cramping;
- Tingling; and
- Stiffness.

Symptoms can vary in their severity, depending on the amount of exposure an employee has had. Often symptoms may appear gradually and be evidenced as muscle fatigue or pain at work that disappears during rest. Usually symptoms become more severe as exposure continues. For example, at first tingling may continue during rest, then numbness or pain may make it difficult to perform the job, and finally pain may be so severe that the employee is unable to perform physical work activities.

There are several reasons why OSHA believes the proposed reporting system is important for a successful ergonomics program. First, an important trigger in this proposed standard is the occurrence of an MSD. In order for an employer to be made aware of MSDs in his or her workplace, employees must have a mechanism for reporting this information. Second, if an accessible reporting system is not made available to employees, they will be discouraged from reporting MSD signs and symptoms and the ergonomics program will fail. A reporting system that is well-known to employees is one way to ensure employee participation in the ergonomics program.

Section 1910.914 further proposes that ''you must evaluate employee reports of MSD signs and symptoms to determine whether a covered MSD has occurred.'' This requirement has been written to allow maximum flexibility for employers. In order to determine whether an employee who has experienced MSD signs or symptoms actually has a covered MSD, many employers will choose to have employees who report MSD signs or symptoms evaluated by an ergonomist or health care professional. Other employers will use ergonomics committee members or other staff with appropriate training. Some employers may have a health care professional available on-site for employee evaluations, and others may use a contract provider to whom employees are referred. Regardless of who does this evaluation, employers would be required to take reports of MSD signs or symptoms seriously and to provide employees, when appropriate, with early assessment and access to prompt and effective evaluation at no cost to the employees. When the occurrence of a covered MSD is confirmed, employers would be responsible for providing MSD management of that MSD to the affected employee. Proposed employer obligations for MSD management are found in sections 1910.929–1910.935 and are discussed below in connection with those sections of the proposed standard.

As part of their basic obligation, employers would also be required to ''periodically provide information to employees that explains how to identify and report MSD signs and symptoms.'' The information that would be required to be communicated to fulfill the basic obligation under this section (§ 1910.914) differs from the information to be provided through the training provisions contained in sections 1910.923–1910.928 of the proposed rule. The information to be shared with employees under this section is general information related to MSDs, MSD hazards, and the ergonomics program. Employees need access to this information in order to be alert to the onset of MSD signs or symptoms and to effectively participate in the ergonomics program, as well as to protect themselves while at work.

In order to provide employers with maximum flexibility, the time intervals for these activities have not been specified in the proposed rule. However, in the section on key terms in this standard (§ 1910.945), OSHA states that ''periodically means that a process or activity, such as records review or training, is performed on a regular basis that is appropriate for the conditions in the workplace.'' By using the term ''regular basis,'' OSHA provides employers with a flexible definition that is adaptable to an employer's specific situation. OSHA proposes that information for employees be provided periodically because retention of information diminishes over time.

The section on key terms in this standard, § 1910.945, further defines ''periodically'' to mean ''that the process or activity is conducted as often as needed, such as when significant changes are made in the workplace that may result in increased exposure to MSD hazards.'' Examples of significant changes in the workplace include the introduction of new equipment, new processes, or new production demands that may increase the likelihood that employees will be exposed to MSD hazards.

Section 1910.915 What information must I provide to employees?

You must provide this information to current and new employees:

(a) Common MSD hazards;

(b) The signs and symptoms of MSDs, and the importance of reporting them early;

(c) How to report MSD signs and symptoms; and

(d) A summary of the requirements of this standard.

Proposed section 1910.915 informs employers of the specific information they must provide to current and new employees in manufacturing operations, manual handling operations and other jobs with covered MSDs. The provision of this information to employees is necessary to facilitate their active participation in the ergonomics program. Additionally, since the identification of problem jobs is triggered by employee reporting of a covered MSD, informed employees are critical to assure the accuracy of the reporting system, regardless of whether the system is written or oral.

OSHA considers ''current'' employees to be those in either manufacturing operations, manual handling operations, or other problem jobs at the time this standard becomes effective. ''New'' employees include newly hired employees, as well as those who are new to manufacturing and manual handling operations or other jobs with covered MSDs, but not necessarily new to the company.

At a minimum, OSHA would require that employers provide their employees with information that covers four topics. First, proposed paragraph (a) would require that employers provide information to current and new employees in manufacturing operations, manual handling operations, and other jobs with covered MSDs so they know about the ''common MSD hazards.'' By using the word ''common'' OSHA means general, as opposed to job specific, MSD hazards.

Second, as stated in paragraph (b), employees must know ''the signs and symptoms of MSDs, and the importance of reporting them early.'' A discussion of MSD signs and symptoms and the importance of early reporting can be found in the summary and explanation of section 1910.914.

The ultimate goal of early reporting of signs and symptoms is to identify MSDs while they are still reversible in order to prevent pain, suffering, and disability due to MSD hazards. Such a goal creates a win-win environment for both employers and employees. Employees are assured that their health and safety will be protected, and employers will benefit from the decreased occurrence and costs of covered MSDs in their workforce.

Third, proposed paragraph (c) would require employers to provide information to their employees in manufacturing operations, manual handling operations and other jobs with covered MSDs so they know how to report MSD signs and symptoms. OSHA does not specify how this information must be shared. It can be communicated either in writing or orally, depending on the nature of the work environment. However, employers must be sure that their affected employees understand how to access this reporting system. This requirement complements the obligation set forth in section 1910.914, which states that employers must set up a way for employees to report MSD signs and symptoms.

Fourth, proposed paragraph (d) would require employers to provide ''a summary of the requirements of this standard'' to their employees in manufacturing operations, manual handling operations, and other jobs with covered MSDs. OSHA believes that employees are entitled to information about the ergonomic program elements and specific requirements contained in this standard. Moreover, employees must have this information to meaningfully participate in the ergonomics program.

OSHA believes that there are many practical ways that employers would be able to accomplish these proposed requirements. One method that aids the understanding of somewhat technical information is to allow employees an opportunity to ask questions about information presented to them and receive answers to their questions. There are many ways that question and answer sessions can be incorporated into the work schedule. Examples include question and answer sessions that are: organized classroom style; part of regularly scheduled meetings with employees and their supervisors; an outgrowth of informal talks with employees; and incorporated into safety meetings. OSHA believes that merely arranging for employees to view a videotape on common MSD hazards, without an opportunity for discussion or questions and answers, is unlikely to ensure that the necessary information has been effectively communicated.

Another method critical to employee understanding of information related to common MSD hazards and the signs and symptoms of MSDs is to provide the information in the language and at levels the employees comprehend. Commercially available information related to common MSD hazards and MSD signs and symptoms is often available in languages other than English and at various comprehension levels. When purchasing prepared informational materials, employers must consider language and comprehension when making their selections. For employers with predominantly non-English speaking workers, an effective alternative to commercially prepared informational material may be selecting and training a worker who speaks both English and the predominant language of the workforce to deliver MSD hazard information. For employers with workers who cannot read, employers would be required to provide information orally or through visual displays or graphics.

OSHA recognizes that retention periods for information, especially technical information, can sometimes be short, and that it often takes multiple presentations of information before it is effectively understood, processed, and applied. Therefore, OSHA would expect employers to be creative in meeting these proposed obligations. Some additional ideas that employers may consider include: posting information in conspicuous locations as a continuous reminder; frequently changing the message conveyed in the posted information so that it doesn't become stale and invisible; using plain language and terms to communicate the information; incorporating visually appealing pictures or displays; and setting up interactive displays of model work stations so employees can experiment with equipment while they are not engaged in production or service provision.

Section 1910.916 What must I do to set up a reporting system?

You must:

(a) Identify at least one person to receive and respond to employee reports, and to take the action this standard requires.

(b) Promptly respond to employee reports of MSD signs or symptoms in accordance with this standard.

Proposed section 1910.916 advises employers of what they must ''do to set up a reporting system.'' This section contains two requirements that employers must meet. First, proposed paragraph (a) would require that employers ''identify at least one person to receive and respond to employee reports, and to take the action this standard requires.'' These proposed requirements provide additional support and encouragement for employees to report MSD signs and symptoms. If employees are expected to report MSD signs and symptoms, there must be at least one person assigned the responsibility to receive and respond to the reports and act upon them.

The employer may decide who the person or persons to receive such reports should be and how many persons are needed. In many places of employment, all front-line supervisors have the responsibility to receive and respond to reports of work-related injuries and illness. In other workplaces, a safety officer or safety committee has the responsibility to receive and respond to such reports. In still other companies an occupational health nurse may be available to receive and respond to reports of MSD signs and symptoms.

Small employers, on the other hand, may choose to carry out these responsibilities themselves instead of delegating them to others. For example, a small employer could simply make sure that all employees are encouraged to report MSD signs and symptoms directly to him or her. In response to those reports, that same small employer would then also be the designated individual to ensure that the appropriate action, as required by this standard, is initiated when the employee has a covered MSD. In the proposed standard the

choice of designee is left to the employer, because OSHA recognizes that various employers may elect to implement this provision differently.

Second, proposed paragraph (b) of this section would require employers to '' promptly respond to employee reports of MSD signs or symptoms in accordance with this standard.'' The summary and explanation for most of this requirement has been previously discussed in section 1910.914, which covers the employer's basic obligation. Any employee reports of MSD signs or symptoms must be taken seriously by the employer; if a covered MSD has occurred, the employee's job is a problem job, and the employer must then comply with the job hazard analysis and control provisions of sections 1910.917 through 1910.922. Such reports may also indicate that an element(s) of the ergonomics program is not properly functioning. Thus, employers must critically evaluate employee reports of MSD signs or symptoms and determine what actions must be taken to comply with the requirements of this proposed Ergonomics Program standard.

Job Hazard Analysis and Control (§§ 1910.917–1910.922)

This part of the Summary and Explanation discusses the proposed requirements for Job Hazard Analysis and Control (§§ 1910.917–1910.922). It describes the proposed requirements, provides information on the process of job hazard analysis and control, and presents examples of controls that have been used effectively by employers to eliminate or materially reduce MSD hazards.

Job hazard analysis and control is the heart of any ergonomics program because it is the first step in eliminating or materially reducing MSD hazards. Through job hazard analysis, employers identify and assess where and how employees' physical capabilities have been exceeded in a given job. It does this by identifying what aspects of the physical work activities and conditions of the job and what ergonomics risk factors may be causing or contributing to the MSD hazards.

Once MSD hazards have been identified, the next step is to eliminate or control them. An effective hazard control process involves identifying and implementing control measures to obtain an adequate balance between worker capabilities and work requirements so that MSDs are not reasonably likely to occur (Karwowski and Salvendy, *Ergonomics in Manufacturing,* 1998, Ex. 26–1419).

OSHA is proposing a flexible approach to the analysis and control of MSD hazards. A flexible approach helps to ensure that the required job hazard analysis and control process is appropriate for a diverse range of employers and is applicable to a variety of different jobs. For example, OSHA believes that both small and large employers will be able to use the job hazard analysis and control provisions of the standard and will be able to comply with them.

Section 1910.917 What is my basic obligation?

You must analyze the problem job to identify the ''ergonomic risk factors'' that result in MSD hazards. You must eliminate the MSD hazards, reduce them to the extent feasible, or materially reduce them using the incremental abatement process in this standard. If you show that the MSD hazards only pose a risk to the employee with the covered MSD, you may limit the job hazard analysis and control to that individual employee's job.

OSHA is proposing that employers analyze jobs in which a covered MSD is reported. (In the proposed rule these jobs are called ''problem jobs.'') If employers determine, through the job hazard analysis, that there are physical work activities and work conditions in the problem job that are reasonably likely to be causing or contributing to the covered MSD, they would be required to implement controls to achieve one of these control endpoints: eliminate MSD hazards, reduce hazards to the extent feasible, or materially reduce the hazard (following the incremental abatement process in § 1910.922). (The control endpoints in this basic obligation section would also apply to those ergonomics programs that might be grandfathered in under § 1910.908.)

1. Covered MSDs

OSHA is proposing to limit employers' obligation to analyze and control MSD hazard requirements to jobs in which covered MSDs have been reported after the date the Ergonomics Program Standard becomes effective. This means that the only employers who would have to analyze and control jobs are those who have determined that a covered MSD has occurred in their workplace.

Many stakeholders support limiting job hazard analysis and control to jobs in which there is an identified MSD hazard, such as an injury (Exs. 3–56, 3–99, 3–114, 3–133, 3–161, 26–1370). Other stakeholders suggested that an ergonomics rule should require employers to analyze and control any job in which employees are exposed to MSD hazards (Exs. 3–141, 3–183, 3–184). OSHA requests comment on whether job hazard analysis and control should be limited to jobs with covered MSDs or expanded to include jobs in which employees are exposed to MSD hazards, even if no injuries have been reported.

2. Problem Jobs

OSHA is proposing that employers must do hazard analysis and control in problem jobs. The requirement that employers analyze jobs with covered MSDs is not limited to the injured employee's job or workstation. It also includes the workstations of others in that job in the establishment who are exposed to the same physical work activities and conditions and thus the same MSD hazards. If the job is performed on more than one work shift in the establishment, the analysis must include employees from the other shifts who are to exposed the same physical work activities and conditions and thus the same MSD hazards. Including in the analysis other employees who perform the same physical work activities is an important proactive measure for preventing other employees from developing the type of MSD that has already occurred at least once among employees who are doing the same type of tasks. (However, the employer would not be required to analyze the same job performed at other establishments of the company.)

OSHA is proposing that the analysis must include all jobs involving the same physical work activities and conditions as those where a covered MSD has occurred, regardless of whether those jobs have the same job title. Using job titles/classifications to determine which jobs are analyzed is not necessarily relevant in terms of safety and health concerns. First, jobs involving the same physical work activities and conditions may have different titles if there are working supervisors/managers, a seniority system, or different work shifts. For example, ''Fabricator II'' on the overnight shift may be performing the same physical work activities as ''Junior Fabricator'' or ''Apprentice Fabricator'' on the day shift. If so, they all may be at increased risk of developing an MSD.

Second, relying on job titles may group together employees who have the same title but whose jobs are quite different. For example, all ''assembler'' jobs on an auto assembly line may not involve the same physical work activities or conditions. One assembler may bolt on a door, another puts on the bumper, while the third one installs the

dashboard. Analyzing these jobs as one group may not be helpful because the physical work activities may be so different that the employees are not exposed to the same risk factors and, as a result, the same controls will not work.

Although employees in jobs in the workplace must be included in job hazard analysis if their jobs involve the same physical work activities and conditions, OSHA recognizes that jobs may not have the same activities and conditions just because employees use the same equipment or are working on the same product. For example, employees do not have to be included if their physical work activities differ in terms of activities and conditions. For example, VDT users may not be considered to be in the same job where one user does inputting for more than 4 hours a day at a modular VDT workstation and the other uses the VDT on the desk only to read and send e-mail messages. These two employees have significantly different levels of exposure to ergonomic risk factors. The fact that employees are working on the same motorcycle assembly line does not necessarily mean they are performing the same assembly job. One employee on that line may be screwing on the shock absorbers, where he is exposed to awkward postures and force, while another employee is exposed to forceful lifting and lowering while putting on the wheels.

On the other side of the same job issue, where employers show that the problem is limited to the employee who reported the MSD, they may limit job hazard analysis and control to addressing the MSD hazards that are affecting that individual employee. They also may limit the remaining elements of their program, such as training, to that individual employee.

Evidence in the record suggests that there are likely to be situations in which the physical work activities or conditions only pose a risk to the reporting employee. For example, an employee in a commercial bakery may report a back or shoulder MSD related to extended reaches involved in sorting rolls. However, other employees who have performed the job for several years do not have (and never have had) difficulties performing the physical work activities of the job. In this case, an employer might conclude that the problem is limited to the injured employee. In this situation, the employer could limit the response (*e.g.*, analysis, control, training) to physical work activities and conditions confronting that injured employee.

Another example might involve manufacturing assembly line job where an employee is much shorter than other employees. The employee reports persistent shoulder and elbow pain, which the employer observes is caused by having to reach higher than the other employees to perform the job tasks. This may also be an appropriate case for the employer to focus the analysis and control efforts on the employee who reported the problem.

Section 1910.918 What must I do to analyze a problem job?

You must:

(a) Include in the job hazard analysis all of the employees in the problem job or those who represent the range of physical capabilities of employees in the job;

(b) Ask the employees whether performing the job poses physical difficulties, and, if so, which physical work activities or conditions of the job they associate with the difficulties;

* * * * *

An ergonomics job hazard analysis is the employer's process for pinpointing the work-related causes of MSDs. It involves examining the workplace conditions and individual elements or tasks of a job to identify and assess the ergonomic risk factors that are reasonably likely to be causing or contributing to the reported MSDs (Ex. 26–2). Job hazard analysis can also be a preventive measure. That is, it is used to identify jobs and job tasks where MSDs and MSD hazards are reasonably likely to develop in the future.

Job hazard analysis is an essential element in the effective control of MSD hazards. In many situations, the causes of MSD hazards are apparent after discussions with the employee and observation of the job, but in other jobs the causes may not be readily apparent. In part, this is because most MSD hazards involve exposure to a combination of risk factors (*i.e.*, multifactoral hazard). For example, it may not be clear in a repetitive motion job whether exposure to repetition, force or awkward postures is the risk factor that is causing the problem.

The job hazard analysis is also important to pinpoint where the risk of harm exists and to rule out aspects of the job that do not put employees at risk. In this sense, a job hazard analysis is an efficient way to help employers focus their resources on the most likely causes of the problem so that the control strategy they select has a reasonable expectation of eliminating or materially reducing the MSD hazards. It also provides employers with the information they need to target their efforts to those jobs or tasks that may pose the most severe problems.

In this proposed standard, the job hazard analysis also serves another purpose. It is a systematic method for confirming whether the employer's initial determination that the MSD is work-related was correct. This is an important step for those employers whose ergonomics programs include early intervention when employees report MSDs. For example, a number of employers said that they provide MSD management first (*i.e.*, immediate restricted work activity whenever an employee reports MSD signs or symptoms), and afterward look to see whether they need to take action to fix the job. For these employers, the job hazard analysis includes two parts: first, after careful examination the employee is determined by the analysis to be exposed to ergonomic risk factors to the extent that a covered MSD is reasonably likely to occur; and second, the employers has determined that no job fix is needed. The job hazard analysis steps in such a case help employers who have an effective reporting and MSD management system and who have relied on a preliminary determination to trigger medical intervention not to go further than is necessary to address the hazard.

The proposed rule does not require that employers use a particular method for identifying and analyzing MSD hazards. Employers are free to select the method or process that best fits the conditions of their workplaces, and there are many different approaches currently in use (see, for example, Exs. 26–2, 26–5). Some employers use simple and fairly informal procedures to analyze their problem jobs. This is especially true for employers who have only limited or isolated problems. For example, the United States General Accounting Office reported that the job hazard analysis process for the ergonomics programs they reviewed often focused only on the particular job element that was thought to be the problem (Ex. 26–5). For other employers, the process may be very detailed or more formalized. For example, their process may include job-task breakdown, videotaping or photographing the job, job or hazard checklists, employee questionnaires, use of measuring tools, or biomechanical calculations (Ex. 26–2). For example, checklists, together with other screening methods such as walk-through observational surveys, and worker and

supervisory interviews, employee symptom or discomfort surveys, are recognized ergonomic evaluation methods (Exs. 26–2, 26–3, ANSI Z–365 Draft, 1997, Ex. 26–1264). A few of these methods are described in this section. Information on other methods of job hazard analysis are included in the public docket of this rulemaking. (Exs. 26–2, 26–5). According to this information and stakeholder comments, the job hazard analysis methods employers use have the following steps or activities in common. OSHA has designed the proposed job hazard analysis requirements around these steps:

- Obtaining information about the specific tasks or actions the job involves;
- Obtaining information about the job and problems in it from employees who perform the job;
- Observing the job;
- Identifying specific job factors; and
- Evaluating those factors (*e.g.*, duration, frequency and magnitude) to determine whether they are causing or contributing to the problem (Ex. 26–2, 26–5, 26–1370).

The proposed rule requires that the hazard analysis and control of problem jobs be conducted by person(s) who have received training in the process of analyzing and controlling MSD hazards (See § 1910.925).

1. Paragraph (a)

Paragraph (a) of proposed § 1910.918 would require that, if the employer does not show that the MSD hazards only pose a risk to the employee who has the covered MSD, the employer must do a job hazard analysis for other employees in the problem job as well as for the injured employee. Doing a job hazard analysis for all employees in a problem job ensures that employers have available the most complete information about the causes of the problem when they are identifying and assessing ways to control MSD hazards. Having this information also helps to ensure that the controls employers select will eliminate or materially reduce MSD hazards for all employees in the job.

At the same time, OSHA is aware that conducting a job hazard analysis that covers all employees in a problem job may be burdensome for some employers. For example, some employers may have large numbers of employees who perform the same job at one workplace (*e.g.*, telephone operators, customer service representatives, catalog sales representatives, data processors, nurses aides, package handlers, sorting and delivery persons). Conducting a job hazard analysis for each one of these employees could be time and resource intensive. In addition, if the controls are likely to be the same for all of the employees in a particular job, continuing to conduct job hazard analyses after a certain point may have diminishing returns.

Doing job hazard analysis for all employees also may be difficult in jobs that do not have fixed workstations (*e.g.*, beverage delivery, package delivery, furniture moving, appliance delivery, home repair, visiting nurse, home health aide). Some of these jobs may have constantly changing work conditions, all of which it may not be possible to analyze.

Therefore, OSHA is proposing in paragraph (a) that employers not be required to conduct a job hazard analysis for each employee in a problem job. Under the Ergonomics Program Standard, employers would be allowed to limit the number of employees' jobs that they analyze, provided that the jobs they do analyze represent the range of physical capabilities of all of the employees who currently are in the job. The intention of this provision is to reduce the job hazard analysis burdens on employers, who would otherwise have to do many individual hazard analyses, while at the same time ensuring that the process accurately identifies and does not underestimate the exposure of employees to the MSD hazards in the problem job.

To ensure that the job hazard analysis is an accurate estimate of exposure, employers would be required to do a job hazard analysis for a sufficient number of employees in the job (from all work shifts) for the analysis to be representative of all of the employees in the problem job in terms of their physical work activities. To illustrate, to get an accurate estimate of exposure to MSD hazards of all employees in an assembly line job, an employer may have to include the following employees in the hazard analysis group:

- Shortest employees in the job because they are likely to have to make the longest reaches or to have a working surface that is too high,
- Tallest employees because they may have to maintain the most excessive awkward postures (*e.g.*, leaning over the assembly line, reaching down with the arms) while performing tasks,
- Employees with the smallest hands because they may have to exert considerably more force to grip and operate hand and power tools,
- Employees who work in the coldest areas of the workplace because they may have to exert more force to perform repetitive motions, and
- Employees who wear bifocals because they may be exposed to awkward postures (*e.g.*, bending neck back to see).

2. Paragraph (b)—''Ask employees''

Paragraph (b) of this section would require employers to consult with employees as part of the job hazard analysis process. Talking or consulting with employees in a problem job helps to ensure that the employer has the complete picture about the problems in a job, especially if the job hazard analysis includes only a limited number of employees. Where the job hazard analysis is limited, consulting with all employees during the hazard analysis and control process is an effective way to gain employee acceptance and minimize resistance to change when implementing controls and job modifications become necessary. Nonetheless, for the reasons discussed in paragraph (a) of this section, OSHA is not proposing to require that employers consult with every employee during the job hazard analysis process, provided that employers consult with at least those employees whose jobs are being analyzed.

Many employers have told OSHA that talking with employees is a quick and easy way to find out what kind of problems are in the job (Ex. 26–1370). They said that talking with employees is often the best way to identify the causes of the problem and to identify the most cost-effective solutions to it (Ex. 26–1370).

Many stakeholders have said that employee input at the job hazard analysis stage is essential (Ex. 26–1370). A comment from Johnson & Johnson sums up this opinion:

> Hazards cannot be addressed efficiently without an accurate evaluation of the situation. The line employee is one of the best sources of this information * * * [they are] local process experts (Ex. 3–232).

Discussions with employers who have set up ergonomics programs, pursuant to corporate settlement agreements with OSHA, also confirm the necessity of employee input in the

job hazard analysis (Ex. 26–1420). A number of these employers said that employees need to be involved in the analysis and control process because ''no one knows the job better than the person who does it'' (Ex. 26–1420). Other stakeholders echo this belief, saying that employees have the best understanding of what it takes to perform each task in a job, and thus, what parts of the job are the hardest to perform or pose the biggest difficulties:

''Job analysis should include input from the workers themselves. The employees can best tell what conditions cause them pain, discomfort, and injuries. They often have easy and practical suggestions on how such problems can be alleviated.'' American Federation of State, County and Municipal Employees (Ex. 3–164).

Involving employees, in addition to helping to ensure that the job hazard analysis is correct, can make the job hazard analysis and control process more efficient. Employees can help employers pinpoint the causes of problems more quickly and, according to a number of stakeholders, employees often come up with some of the best practical, no-cost or cost-effective, solutions (Ex. 26–1370). The American Health Care Association agrees:

Employers and employees alike who work in the industry are in the best possible position to identify risk factors in their workplace and to develop prevention methods that concentrate on the significant problems unique to their particular industry's environment (Ex. 3–112).

There are many different ways in which employers can comply with the requirement to ask employees about the problem job, and OSHA does not intend to require employers to use a certain method. Employers are free to use any method to get information from employees about the problems in the job. Employers may do something as simple as informally talking with employees while observing the job being performed. Consulting with employees in the problem job can be made part of a regular staff or production meeting or ''toolbox chat.'' Employers may ask employees through surveys/questionnaires and more formal employee interviews. Many employers have developed very effective tools for gathering important job information from employees who do the job.

AMP Inc., a manufacturer of electronic components, with 300 employees, uses a one-page ''Ergonomic Evaluation Form'' that asks employees to answer simple ''yes/no'' questions about the employee's ease and comfort when performing certain job tasks. After the company's ergonomics team (comprised of line employees) reviews the form, a member of the team interviews the employee. (Ex. 26–5).

Paragraph (b) would require that employers ask employees whether performing the job poses physical difficulties. This language should not be interpreted as requiring employers to conduct symptom or discomfort surveys. Rather, the intention of this provision is for employers to ask employees to help identify the physical work activities, job conditions and ergonomic risk factors that may be making the job difficult to perform.

Section 1910.918 What must I do to analyze a problem job?

You must:

* * * * *

(c) Observe the employees performing the job to identify which of the following physical work activities, workplace conditions and ergonomic risk factors are present:

PHYSICAL WORK ACTIVITIES AND CONDITIONS	ERGONOMIC RISK FACTORS THAT MAY BE PRESENT
(1) Exerting considerable physical effort to complete a motion	(i) Force (ii) Awkward postures (iii) Contact stress
(2) Doing same motion over and over again	(i) Repetition (ii) Force (iii) Awkward postures (iv) Cold temperatures
(3) Performing motions constantly without short pauses or breaks in between	(i) Repetition (ii) Force (iii) Awkward postures (iv) Static postures (v) Contact stress (vi) Vibration
(4) Performing tasks that involve long reaches	(i) Awkward postures (ii) Static postures (iii) Force
(5) Working surfaces are too high or too low	(i) Awkward postures (ii) Static postures (iii) Force (iv) Contact stress
(6) Maintaining same position or posture while performing tasks	(i) Awkward posture (ii) Static postures (iii) Force (iv) Cold temperatures
(7) Sitting for a long time	(i) Awkward posture (ii) Static postures (iii) Contact stress
(8) Using hand and power tools	(i) Force (ii) Awkward postures (iii) Static postures (iv) Contact stress (v) Vibration (vi) Cold temperatures
(9) Vibrating working surfaces, machinery or vehicles	(i) Vibration (ii) Force (iii) Cold temperatures
(10) Workstation edges or objects press hard into muscles or tendons	(i) Contact stress
(11) Using hand as a hammer	(i) Contact stress (ii) Force
(12) Using hands or body as a clamp to hold object while performing tasks	(i) Force (ii) Static postures (iii) Awkward postures (iv) Contact stress
(13) Gloves are bulky, too large or too small	(i) Force (ii) Contact stress

PHYSICAL WORK ACTIVITIES AND CONDITIONS	ERGONOMIC RISK FACTORS THAT MAY BE PRESENT
MANUAL HANDLING (Lifting/lowering, pushing/pulling, and carrying)	
(14) Objects or people moved are heavy	(i) Force (ii) Repetition (iii) Awkward postures (iv) Static postures (v) Contact stress
(15) Horizontal reach is long (Distance of hands from body to grasp object to be handled)	(i) Force (ii) Repetition (iii) Awkward postures (iv) Static postures (v) Contact stress
(16) Vertical reach is below knees or above the shoulders (Distance of hands above the ground when object is grasped or released)	(i) Force (ii) Repetition (iii) Awkward postures (iv) Static postures (v) Contact stress
(17) Objects or people are moved significant distance	(i) Force (ii) Repetition (iii) Awkward postures (iv) Static postures (v) Contact stress
(18) Bending or twisting during manual handling	(i) Force (ii) Repetition (iii) Awkward postures (iv) Static postures
(19) Object is slippery or has no handles	(i) Force (ii) Repetition (iii) Awkward postures (iv) Static postures
(20) Floor surfaces are uneven, slippery or sloped	(i) Force (ii) Repetition (iii) Awkward postures (iv) Static postures

* * * * *

1. Paragraph (c)

Paragraph (c) of proposed § 1910.918 requires employers to do the following:

- Observe the employee performing the job,
- Identify whether any of the physical work activities or conditions listed in the section are present, and
- Identify whether any of the relevant ergonomic risk factors listed in the section are involved in the particular work activity or condition.

a. ''Observe'' employees performing the job. The proposed rule requires employers to watch employees perform the physical work activities of the job and look at the conditions under which the job is performed. Job observation allows the employer to see how the employee does the job and provides information about the workstation layout, tools, equipment and general environmental conditions in the workplace.

There are several ways employers may comply with the observation requirement of the proposed standard. Employers may simply watch employees perform the job tasks. Often, all it takes to identify the problem and how to solve it is to watch the employee do the job. For example, watching a data processor reaching to use the mouse because the keyboard tray is not long enough to accommodate it may be all it takes to identify the likely cause of the employee's shoulder pain.

Videotaping the job is a common practice for ''observing'' jobs. A number of employers, especially in situations where the work activities are complex or the causes of the problem may not be easily identifiable, say that they videotape or photograph the job. These employers find it helpful to be able to refer to a record of the job while evaluating the ergonomic risk factors or identifying and assessing possible control measures (Ex. 26–1370).

''Job task analysis'' is another job hazard analysis process that is widely used. This process involves breaking the job down into its various discrete elements or actions and then identifying and evaluating or measuring the extent to which the risk factors that are present in the physical work activities and conditions are reasonably likely to be contributing to the MSD hazard (Exs. 26–2, 26–1247). To do a job task breakdown, a number of employers look at the job as a series of individual, distinct tasks or steps (Exs. 26–2, 26–5, 26–1247, 26–1370). Focusing on each task allows for easier identification of the physical activities required to complete the job. While observing the job employers record a description of each task for use in later risk factor analysis as well as other information that is helpful in completing the analysis:

- Tools or equipment used to perform task,
- Materials used in task,
- Amount of time spent doing each task,
- Workstation dimensions and layout,
- Weight of items handled,
- Environmental conditions (cold, glare, blowing air),
- Vibration and its source,
- Personal protective equipment worn (Ex. 26–2).

Many employers use hazard identification and analysis checklists to help focus the job observation process. OSHA agrees that well designed checklists, when used in the context for which they are intended, do provide a range of employers, especially small business owners, with effective alternatives to hiring a consultant. There are many ways in which checklists may be useful: identifying physical work activities and conditions, identifying ergonomic risk factors, evaluating jobs, prioritizing jobs for further analysis, and providing a systematic review of risk factors.

b. Identify physical work activities, workplace conditions and ergonomic risk factors. Paragraph (c) would require that, as part of the job observation, employers identify the physical work activities, workplace conditions, and ergonomic risk factors present in the problem job that may be causing or contributing to the MSD hazard. Identifying the presence of physical work activities and conditions is the starting point for pinpointing the hazards the job may involve. Once the applicable activities and conditions are identified, employers would have to determine whether any of the ergonomic risk factors that OSHA has listed as being potentially relevant to those activities and conditions are present.

c. Ergonomic risk factors. Ergonomic risk factors are the aspects of a job or task that impose a biomechanical stress on the worker. Ergonomic risk factors are the synergistic

elements of MSD hazards. In the Health Effects section of this preamble (section V), OSHA discusses the large body of evidence supporting the finding that exposure to ergonomic risk factors in the workplace can cause or contribute to the risk of developing an MSD. This evidence, which includes thousands of epidemiologic studies, laboratory studies, and extensive reviews of the existing scientific evidence by NIOSH and the National Academy of Science, shows that the following ergonomic risk factors are most likely to cause or contribute to an MSD:

- Force
- Repetition
- Awkward postures
- Static postures
- Vibration
- Contact stress
- Cold temperatures

These risk factors are described briefly below (a more detailed discussion of ergonomic risk factors is included in the Health Effects section):

Force. Force refers to the amount of physical effort that is required to accomplish a task or motion. Tasks or motions that require application of higher force place higher mechanical loads on muscles, tendons, ligaments, and joints (Ex. 26–2). Tasks involving high forces may cause muscles to fatigue more quickly. High forces also may lead to irritation, inflammation, strains and tears of muscles, tendons and other tissues.

The force required to complete a movement increases when other risk factors are also involved. For example, more physical effort may be needed to perform tasks when the speed or acceleration of motions increases, when vibration is present, or when the task also requires awkward postures.

Force can be internal, such as when tension develops within the muscles, ligaments and tendons during movement. Force can also be external, as when a force is applied to the body, either voluntarily or involuntarily. Forceful exertion is most often associated with the movement of heavy loads, such as lifting heavy objects on and off a conveyor, delivering heavy packages, pushing a heavy cart, or moving a pallet. Hand tools that involve pinch grips require more forceful exertions than those that allow other grips, such as power grips.

Repetition. Repetition refers to performing a task or series of motions over and over again with little variation. When motions are repeated frequently (*e.g.*, every few seconds) for prolonged periods (*e.g.*, several hours, a work shift), fatigue and strain of the muscle and tendons can occur because there may be inadequate time for recovery. Repetition often involves the use of only a few muscles and body parts, which can become extremely fatigued while the rest of the body is little used.

Awkward postures. Awkward postures refer to positions of the body (*e.g.*, limbs, joints, back) that deviate significantly from the neutral position [1] while job tasks are being performed. For example, when a person's arm is hanging straight down (*i.e.*, perpendicular to the ground) with the elbow close to the body, the shoulder is said to be in a neutral position. However, when employees are performing overhead work (*e.g.*, installing or repairing equipment, grasping objects from a high shelf) their shoulders are far from the neutral position. Other examples include wrists bent while typing, bending over to grasp or lift an object, twisting the back and torso while moving heavy objects, and squatting. Awkward postures often are significant contributors to MSDs because they increase the work and the muscle force that is required.

Static postures. Static postures (or ''static loading'') refer to physical exertion in which the same posture or position is held throughout the exertion. These types of exertions put increased loads or forces on the muscles and tendons, which contributes to fatigue. This occurs because not moving impedes the flow of blood that is needed to bring nutrients to the muscles and to carry away the waste products of muscle metabolism. Examples of static postures include gripping tools that cannot be put down, holding the arms out or up to perform tasks, or standing in one place for prolonged periods.

Vibration. Vibration is the oscillatory motion of a physical body. Localized vibration, such as vibration of the hand and arm, occurs when a specific part of the body comes into contact with vibrating objects such as powered hand tools (*e.g.*, chain saw, electric drill, chipping hammer) or equipment (*e.g.*, wood planer, punch press, packaging machine). Whole-body vibration occurs when standing or sitting in vibrating environments (*e.g.*, driving a truck over bumpy roads) or when using heavy vibrating equipment that requires whole-body involvement (*e.g.*, jackhammers).

Contact stress. Contact stress results from occasional, repeated or continuous contact between sensitive body tissue and a hard or sharp object. Contact stress commonly affects the soft tissue on the fingers, palms, forearms, thighs, shins and feet. This contact may create pressure over a small area of the body (*e.g.*, wrist, forearm) that can inhibit blood flow, tendon and muscle movement and nerve function. Examples of contact stress include resting wrists on the sharp edge of a desk or workstation while performing tasks, pressing of tool handles into the palms, especially when they cannot be put down, tasks that require hand hammering, and sitting without adequate space for the knees.

Cold temperatures. Cold temperatures refer to exposure to excessive cold while performing work tasks. Cold temperatures can reduce the dexterity and sensitivity of the hand. Cold temperatures, for example, cause the worker to apply more grip force to hold hand tools and objects. Also, prolonged contact with cold surfaces (*e.g.*, handling cold meat) can impair dexterity and induce numbness. Cold is a problem when it is present with other risk factors and is especially problematic when it is present with vibration exposure.

Of these risk factors, evidence in the Health Effects chapter shows that force (*i.e.*, forceful exertions), repetition, and awkward postures, especially when occurring at high levels or in combination, are most often associated with the occurrence of MSDs. Exposure to one ergonomic risk factor may be enough to cause or contribute to a covered MSD. For example, a job task may require exertion of so much physical force that, even though the task does not involve additional risk factors such as awkward postures or repetition, an MSD is likely to occur. For example, using the hand or knee as a hammer (*e.g.*, operating a punch press or using the knee to stretch carpet during installation) alone may expose the employee to such a degree of physical stress that the employee has a significant risk of being harmed.

[1] Neutral posture is the position of a body joint has requires the least amount of muscle activity to maintain. For example, the wrist is neutral in a handshake position, the shoulder is neutral when the elbow is near the waist, the back is neutral when standing up straight.

However, most often ergonomic risk factors act in combination to create a hazard. The evidence in the Health Effects section shows that jobs that have multiple risk factors have a greater likelihood of causing an MSD, depending on the duration, frequency and/or magnitude of exposure to each. Thus, it is important that ergonomic risk factors be considered in light of their combined effect in causing or contributing to an MSD. This can only be achieved if the job hazard analysis and control process includes identification of all the ergonomic risk factors that may be present in a job. If they are not identified, employers will not have all the information that is needed to determine the cause of the covered MSD or understand what risk factors need to be reduced to eliminate or materially reduce the MSD hazards.

Although certain of the risk factors described above are easy to identify and it is not difficult to understand why they may be likely to create hazardous exposures, others are not as apparent or observable. Employers who already have ergonomics programs and persons who manage ergonomics programs should not have difficulty identifying risk factors in the workplace. Because these persons have training and experience, ergonomic risk factors are likely to be familiar concepts for them. Through the process of developing and implementing their ergonomics programs these persons have gained a good working knowledge of the ergonomic risk factors that are most likely to be present in their workplaces.

For those employers who are just beginning their programs and have little or no training and experience dealing with ergonomic risk factors, OSHA has tried to make the process of identifying them as workable as possible. Therefore, in the proposed rule OSHA has taken the ergonomic risk factors and the combination of risk factors most associated with the occurrence of MSDs and tried to present them in ways that those with more limited knowledge about ergonomics can readily identify. In this way, the ergonomic risk factors the proposed rule covers are presented in terms of specific and physically observable work activities and conditions. If any of these activities or conditions are present, the table in § 1910.918(c) tells employers which risk factors are likely to be relevant.

OSHA is proposing that employers use this list of physical work activities or conditions as a starting point for hazard evaluation, for several reasons. First, the list of activities and conditions is easy for employers to understand because they will be able to translate them to their own workplaces more readily than would be the case for ergonomic to risk factors. For example, ''hand used as a hammer'' is more easily understood than the term ''contact stress,'' and ''long reaches'' graphically explains an ''awkward posture'' that may be a problem.

Second, the list helps employers quickly focus on the aspects of a job that are most likely to be associated with covered MSDs. At the same time, the list also identifies the risk factors that are most likely to be associated with the activities and/or conditions, which should help employers further focus their analysis. In this way the list serves as a bridge to the combinations of risk factors that studies have shown to be associated with an increased risk of developing work-related MSDs.

Third, having employers start the MSD identification and evaluation process with this list ensures that the analysis will be comprehensive. This is because the list includes the major components of work that have been associated with MSDs.

c. Physical work activities and conditions. The physical work activities and conditions OSHA has included in the proposed rule cover the basic physical aspects of jobs and workstations. These aspects include:

- Physical demands of work;
- Workplace and workstation conditions and layout;
- Characteristics of object(s) that are handled or used; and
- Environmental conditions.

The following table shows the physical work activities and workplace conditions that are associated with those physical aspects:

PHYSICAL ASPECTS OF JOBS AND WORKSTATIONS	EXAMPLES OF PHYSICAL WORK ACTIVITIES AND CONDITIONS ASSOCIATED WITH THE PHYSICAL ASPECT
Physical demands of work	• Exerting considerable physical effort to complete a motion • Doing the same motion over and over again • Performing motions constantly without short pauses or breaks in between • Maintaining same position or posture while performing tasks • Sitting for a long time • Using hand as a hammer • Using hands or body as a clamp to hold object while performing tasks • Objects or people are moved significant distances
Layout and condition of the workplace or workstation	• Performing tasks that involve long reaches • Working surfaces too high or too low • Vibrating working surfaces, machinery or vehicles • Workstation edges or objects press hard into muscles or tendons • Horizontal reach is long • Vertical reach is below knees or above the shoulders • Floor surfaces are uneven, slippery or sloped
Characteristics of the object(s) handled	• Using hand and power tools • Gloves bulky, too large or too small • Objects or people moved are heavy • Object is slippery or has no handles

PHYSICAL ASPECTS OF JOBS AND WORKSTATIONS	EXAMPLES OF PHYSICAL WORK ACTIVITIES AND CONDITIONS ASSOCIATED WITH THE PHYSICAL ASPECT
Environmental Conditions	• Cold temperatures

Employers who examine the job in which a covered MSD occurred to identify the physical work activities and workplace conditions in paragraph (c) and then evaluate the risk factors that OSHA has identified as potentially relevant, will be considered to be in compliance with the hazard analysis requirements of the proposed rule.

Exerting considerable force to complete a motion (*i.e.*, forceful exertions). It is not difficult to understand why jobs that require employees to apply a lot of physical effort may involve significant exposure to ergonomic risk factors and pose an increased risk of injury. For example, it is easy to see how much biomechanical stress employees are under when you see them grimace while trying to loosen lug nuts on an old tire, shift body weight and stance to wrench open stuck valves, or stiffen the body in order to lift a heavy or bulky object from the floor of a truck. Simply put, forceful exertions like these take more out of a person than tasks that do not require much physical effort. An easy way to confirm whether a task involves forceful exertions is to ask workers who are doing the task, or to try to do it yourself.

Performing forceful exertions requires an application of considerable contraction forces by the muscles, which causes them to fatigue rapidly. The more force that must be applied in the exertion, the more quickly the muscles will fatigue or become strained. Excessive or prolonged exposure to forceful exertions also leads to overuse of muscles and may result in muscle strain, soreness and damage. Performing forceful exertions can also irritate tendons, joints and discs, which leads to inflammation, fluid build up, and constriction of blood vessels and nerves in the area. Increased compression of nerves from the pressure imposed by inflamed tendons or muscle contractions may cause disorders of the nervous system (*e.g.*, carpal tunnel syndrome and other nerve entrapment disorders).

Injuries related to forceful exertions can occur in any tissue or joint. As mentioned above, back injuries from overexertion are a leading cause of workplace injuries and workers' compensation cases. A number of studies also show that repeated forceful exertions of the hands and arms are associated with work-related MSDs (*e.g.*, using tools, pinching or pushing with the fingers).

Lifting and carrying heavy objects are usually the tasks that come to mind as examples of forceful lifting tasks, but high forces are also involved in other types of jobs. These include jobs that require employees to apply pinch forces with their fingers (*e.g.*, picking up or placing small items on an assembly line with the fingers), static forces (*e.g.*, applying a lot of physical effort to put the last turn on a screw, pulling hard on a 30-inch wrench to loosen a bolt), and dynamic forces (*e.g.*, tossing objects into containers). (Forceful lifting/lowering, pushing/pulling and carrying are discussed under ''Manual Handling'' activities and conditions below.)

Force. Performing forceful exertions may place excessive mechanical loads on the tissues (*e.g.*, muscles, tendons, other tissues) that are used to exert or transfer force from the skeletal system to the work. Heavy loading of tissues causes the body to fatigue more quickly, and increases the amount of time tissues need to recover from the effects of such exertions. Tasks involving prolonged forceful exertions or excessive force alone can result in harm, including muscle strain or tears. However, where other risk factors are present, especially frequent repetition of exertions, awkward postures, or static postures they add to the force required to accomplish the exertion. In such cases, even tasks involving moderate levels of force may lead to injury and tissue damage because there may not be adequate recovery time. Forceful exertions can also cause or contribute to nerve disorders. Application of high levels of muscle and tendon tension and the contraction necessary to perform forceful exertions may increase pressure on entrapped/confined nerves and other tissues. For example, many employees who perform cutting and trimming tasks on poultry production lines have developed carpal tunnel syndrome (*e.g.*, a nerve entrapment disorder) from repeated forceful exertions of the hands and wrists to cut through the skin, meat, or bone. The continuous application of muscle-tendon movements in the hand and wrist inflames the tendons and puts pressure on the median nerve running through the carpal tunnel in the wrist to the hand. In addition, if the tendons and other soft tissue in the wrist or hand do not have adequate recovery time from the forceful exertions, they can become inflamed enough to put pressure on the median nerve.

Examples:
Pulling meat off a bone on a meat cutting assembly line,
Pulling hard to tighten bolts or screws in assembly line work,
Squeezing hard on a pair of pliers, or
Pulling hard on a long wrench to tighten or loosen a bolt

Awkward postures. Working in awkward postures increases the amount of force needed to accomplish an exertion. Awkward postures create conditions where the transfer of power from the muscles to the skeletal system is inefficient. To demonstrate this, hold a dry marker in your hand with your wrist straight and then let someone try to pull it out of your hand. Now hold the marker with your wrist bent toward the inside of your forearm as far as you can and hold the marker while someone tries to pull it out of your hand. To overcome muscle inefficiency, employees must apply more force both to initiate and complete the motion or exertion. In general, the more extreme the postures (*i.e.*, the greater the postures deviate from neutral positions), the more inefficiently the muscles operate and, in turn, the more force is needed to complete the task. Thus, awkward postures make forceful exertions even more forceful, from the standpoint of the muscle, and increase the amount of recovery time that is needed.

Examples:
- Throwing 20-pound bundles of printed material to overhead conveyors.
- Bolting or screwing a new part into an auto that is on a lift.

Contact stress. Mechanical friction (*i.e.*, pressure of a hard object on soft tissues and tendons) causes contact stress, which is increased when tasks require forceful exertion. The addition of force adds to the friction created by the repeated or continuous contact between the soft tissues and a hard object. It also adds to the irritation of tissues and/or to the pressures on parts of the body, which can further inhibit blood flow and nerve conduction.

Examples:
- Using the hand as a hammer is an example of force plus contact stress.
- Operating a carpet kicker with the knees

Doing the same motions over and over again (*i.e.*, repetitive motions). Many jobs that involve repetition of the same job again and again are apparent even upon cursory observation: assembly line jobs where motions are repeated every few seconds, data processing jobs, directory assistant operators, court reporting, letter and package sorting. Repetitive motion jobs include performance of identical motions again and again, but also include repeating multiple tasks where the motions of each task are very similar and involve the same muscles and tissues.

Evidence in the Health Effects section shows a strong association between the occurrence of MSDs and jobs involving exposure to repetitive motions. The joints are most susceptible to repetitive motion injuries, especially the wrists, fingers, shoulders, and elbows. Repetitive work that is done with the foot (*e.g.*, operating foot activated controls) or knees (*e.g.*, climbing ladders or using a carpet kicker) may also result in an MSD.

Repetition. Motions that are repeated again and again with little variation may cause fatigue and overuse of the muscles, tendons, and joints that are involved in the exertion (Ex. 26–2). Overuse leads to muscle strain, inflammation of joints and tendons, and increased pressure on nerves. As exposure continues or intensifies (*e.g.*, pace increases) tears in muscle fibers occur. The more frequently repetitive motions are performed (*i.e.*, fast pace), the longer they are performed (*i.e.*, long sessions without a break or more than 8 hours a day), and/or the more risk factors that are involved, the greater the risk of injury due to overuse and lack of adequate recovery time.

Exposure to repetition alone can cause MSDs. This is especially true where the same motions or tasks are performed for an extended period and/or where the task cycle is short (*e.g.*, the task cycle lasts only a few seconds). The risk of injury is significantly increased when other risk factors are also present.

Examples:
- Packing bags of potato chips into shipping boxes.
- Intensive keying of information into computer.

Force. The effects of repetitive motions on the body are increased when high forces are involved. Repetition of forceful exertions requires employees to exert more muscle tension and contraction, which leads to muscle fatigue. When repetitive motions involve high forces, even more recovery time is required for muscles than repetitive motions that do not contain high forces.

Prolonged repetition of forceful exertions also may result in inflammation in tendons and joints. In addition, the added muscle tension from forceful repetitive motions also puts more pressure on surrounding nerves and other confined tissues. This may cause damage to entrapped nerves and tissues.

Examples:
- Filleting fish in a processing plant, or
- Constantly using screwdriver to drive screws into wood.

Awkward postures. Performing repetitive motions in awkward postures (*e.g.*, bent wrists, extended arms) adds significantly to the muscular effort required to perform each motion. The added force hastens the onset of fatigue and increases the likelihood of injury from overuse.

In some cases, awkward postures may be so extreme that they can turn a low risk repetitive motion job into a high risk job. For example, an assembly job involving tightening bolts may not pose any problem where objects being assembled are at mid-torso level. However, the same job at the same pace may be hazardous if tightening the bolts involves overhead work.

Examples:
- Sorting parts or letters into bins of different heights and locations (*e.g.*, behind the employee), or
- Working with bent wrists to assemble small circuit breakers.

Cold temperatures. Cold temperature adds to the amount of force necessary to perform repetitive motions and increases the perception of stiffness of the joints and tissues in the body. Exposure to cold temperatures triggers the body to redirect blood flow from the extremities (hands, feet, and ears) in order to conserve body heat. When the blood supply to the hands is diminished, the manual dexterity and tactile sensitivity of the fingers are reduced. Employees compensate by applying more force to the muscles in the hands and fingers in order to complete the motions.

Exposure to cold temperatures also reduces the ability of tissues to recover from repetitive exertions. The reduction in blood flow reduces the delivery of oxygen and energy to tissues, and the removal of heat and waste products. This reduction in blood flow can also lead to pain and injury.

Example:
- Trimming chicken or turkey breasts in a processing plant, or
- Working in an operating room of a hospital.

Performing motions constantly without short pauses or breaks in between (*i.e.*, inadequate recovery time). Jobs that do not provide short pauses or breaks between motions or task cycles are often a problem because there may not be adequate time for muscles to recover from the effects of the exertion before the motion must be repeated. If there are no pauses between motions or the pauses are too short, the muscles cannot recover to the rested condition. Thus, the effects of the forces on the muscles accumulates and the muscles become fatigued and strained. The lack of adequate recovery time often occurs in jobs involving highly repetitive tasks. This happens when task cycle lengths are very short, which also means that the job involves a high number of cycle repetitions per minute. For example, some research shows that tendons and muscles in the wrists may not be able to recover where repeated task cycles are less than 5 seconds in length, that is, they are repeated more than 12 times per minute (Ex. 26–2).

Jobs involving constant muscle activity (static contractions) also may not provide adequate recovery time. These types of jobs may involve continuously holding hand tools (*e.g.*, knife, paint brush, staple gun), which means that employees have constant exposure to static postures and low contraction forces.

The longer motions or job tasks are performed, the less likely that there will be adequate recovery time. The accumulation of exposure leads to muscle fatigue or overuse. In addition, where the intensity of exposure is greater, for example, in repetitive motion jobs that involve exposure to additional risk factors (*e.g.*, force, awkward postures, or static postures), the increased forces required for the exertion also increase the amount of recovery time that is needed. Any part of the musculoskeletal system involved in moving the body is subject to injury where there is inadequate recovery time, and the recovery times needed vary by body part. For example, although employees may

not be at high risk for forearm injury if task cycles are 25 seconds long or not repeated more than 3 times per minute, they may be at high risk of shoulder injury under this regimen.

Repetition. As task cycles in repetitive motion jobs get shorter (and the number of repetitions per minute increases) employees are at greater risk of injury. Where task cycles are short, the same muscles are in constant use and the muscles get no rest from the force required to perform the task cycle. In addition, where task cycles are short, there is little variation in the physical demands of the tasks, which would allow some muscles to rest while others are in use. Thus, muscle fatigue continues to accumulate and may lead to muscle-tendon strain.

The following table shows the frequency of repetition and length of tasks cycles that are associated with increased risk of injury in repetitive motion jobs:

BODY AREA	FREQUENCY REPETITION PER MINUTE	LEVEL OF RISK	VERY HIGH RISK IF MODIFIED BY EITHER:
Shoulder	More than 2.5	High	High external force, speed, high static load, extreme posture,
Upper arm/elbow	More than 10	High	Lack of training, high output demands, lack of control,
Forearm/wrist	More than 10	High	Long duration of repetitive work
Finger	More than 200	High	

(Kilbom, 1994)

Examples:
- Deboning operation in a poultry plant where the cycle time is short and the birds are conveyed at a fast rate,
- Inserting coils to build an inner-spring mattress at a rate of one per second, or
- Letter sorting.

Force. Motions involving high forces, like highly repetitive motions, put a lot of mechanical stress on the body because muscles must apply considerably more contraction forces to accomplish the task. Thus, these tasks require significantly more muscle recovery time as compared to tasks that do not involve high force. If recovery time is not adequate, these employees are at greater risk of injury due to fatigue and overexertion.

Examples:
- The chuck boner job in a beef processing plant, or
- Shaking crab meat from Alaskan king crab legs.

Awkward postures, static postures, contact stress, vibration. The presence of any or all of these risk factors in a job, particularly jobs involving repetitive motion or forceful exertion, increases the force already required to perform job tasks and, therefore, increases the amount of time muscles need to recover from the exertions the task requires. If the recovery time is not adequate, the presence of these risk factors hastens the onset of fatigue and the effects associated with overuse of muscles, joints and tendons.

Examples:
- Attaching doors on the bathroom vanity assembly line, or
- Capping and cupping cookies on an assembly line.

Performing tasks that involve long reaches. Many job tasks involve long reaches: working overhead, putting items on a high shelf, reaching across a conveyor to put in a part or grasp an object, or bending over to reach a part in the bottom of a big supply box. These tasks expose employees to extreme awkward postures. Where long reaches are momentary and/or infrequent and the forces are low, these tasks are not a problem because there is likely to be adequate time for the body to recover between reaches. However, when long reaches are done frequently, force is involved and/or a long reach lasts more than a few seconds, the risk of harm increases.

Long reaches usually have the greatest impact on the shoulders and lower back. The shoulder is unique in its wide range of motion when compared with other joints in the body. The bony restraints are minimal, but soft tissue constrains the motion. Thus, injuries usually occur when the soft tissue is used to maintain an awkward posture and/or forceful exertion.

The back is flexed forward or extended back to extend reaches beyond the limit of the arm length. In addition, workers in repetitive jobs will often bend their back so that they can reduce the awkward shoulder posture. Bending the back forward adds the weight of the upper body to the force exerted by the back muscles and supported by the spine. Bending to the side, backwards or twisting puts the spine and back muscles in awkward postures.

Awkward postures. When employees are performing tasks that involve long reaches they are exposed to extreme awkward postures; that is, the positions of their shoulders, elbows and/or back deviate significantly from more neutral positions. Repeatedly performing tasks in such positions poses increased stress on the joints and/or spinal discs. As mentioned before, muscles do not work as efficiently in awkward postures, and the muscles must exert more physical effort to accomplish the task. This increased force contributes to muscle-tendon fatigue and strain. For example, the shoulder may deviate at least 90° from its neutral position when reaching across a conveyor to grasp an object. If the employee continues doing such reaches, the stress on the muscles and tendons in the shoulder can cause irritation and inflammation of the tendons and shoulder joint. This, in turn, may place increased pressure on nerves and blood vessels, reducing the supply of blood to the affected muscles and tendons.

Examples:
- Reaching above the head to activate a press or other machine,
- Reaching frequently for small parts in a bin that is at or close to the limit of the arm's reach,
- Reaching down and behind the back to pick up parts to feed to a press or place on a conveyor,
- Reaching across a conveyor to pick up items.

- Reaching to pick up items on the other side of the scanner on a grocery checkout conveyor.

Static postures. The effects on the body from doing tasks that require long reaches are exacerbated where the reaches must be maintained for more than a very few seconds. Holding extreme postures places very high static loads on the body, resulting in rapid fatigue. Not only do the static postures add to the muscular effort required to do the task, but the lack of motion impedes the blood flow that is necessary for tissue recovery.

The constricted blood flow reduces the supply of nutrients to the muscles and the removal of acids and other waste products away from the tissues. Reduced blood flow also slows down delivery of oxygen to the muscles.

The longer or more frequently static loading occurs, the greater the risk of injury due to overuse of muscles, joints and other tissues.

Examples:
- Doing extensive repair work when the automobile is overhead on a vehicle lift.
- Holding out the arm to use a mouse that is on a surface more than 15 inches from the body because the keyboard tray is not big enough to hold the mouse.

Force. Because of exposure to extreme postures, tasks that involve long reaches require considerably more force to accomplish than tasks that can be performed close to the body. For example, it requires much more physical effort to hold and operate a 10-pound rivet gun 2 feet in front or above the body than close to the body. First, the employee must apply more muscle force to simply hold a 10-pound gun when the arms are extended and the back is bent. The longer the gun must be held in that position, the more effort the muscles must exert. Second, the employee must apply more force in order to operate the gun in such an extreme position. Thus, long reaches can turn a low or moderate force task into a high force task that places employees at greater risk of harm. The addition of static postures to the extreme awkward postures further increases the force necessary to perform the task. Muscle-tendon fatigue and strain may occur very rapidly where these tasks are performed frequently because of lack of time to recover from such forceful exertions.

Long reaches can also increase the dynamic forces of the exertion. For example, long reaches to get a bag of flour from a shopping cart and bring it to the scanner can result in high acceleration forces of the back and wrist.

Finally, employees may be exposed to forceful exertions, even if long reaches do not involve lifting heavy objects. When employees bend over to perform long reaches, the muscles in the back must exert a lot of force to lift and lower the weight of the upper body. This causes the back muscles to fatigue more rapidly and puts pressure on the discs in the lower back. Where employees have to maintain long reaches for more than a few seconds, a large amount of static force is applied by the back muscles to the discs.

Examples:
- Throwing items into an overhead container,
- Reaching over the bagging area to place bags of groceries into shopping carts.

Working surfaces are too high or too low. Working surfaces that are too high or too low are another way in which employees are exposed to awkward postures. Where employees must work on such surfaces for a long period, the risk of tissue damage and other MSD problems increases.

Working surfaces can be too high or too low for many employees because most working surfaces are not adjustable. For example, 30 inches is a typical height for desks, tables and other working surfaces operated from a sitting position, and 36 to 40 inches is a typical height range for working surfaces operated from a standing position. Although employees of average height may be able to work comfortably at these working surfaces, the typical heights may not work for shorter or taller employees. An assembly-line employee who is 6′5″ may have to bend over significantly to assemble the parts on a conveyor that is 36 inches high, while a 5-foot employee working on a 42-inch conveyor may have to work with her elbows away from the body.

The height of working surfaces can also be too high or too low when employees must use work surfaces or workstations that were not designed for the tasks being performed. For example, typical desks (*i.e.*, 30 inches high) are not designed for computer use. Even persons of average height may have to raise their elbows and shoulders to use the keyboard on their desks. This is especially true where desk chairs cannot be raised high enough to correct the problem. Even when the employee can be raised to a good height, the feet are often left dangling above the floor.

Awkward postures. Awkward posture is the primary ergonomic risk factor to which employees are exposed when the height of working surfaces is not correct. Working at surfaces that are too high can affect several parts of the body. Employees may have to lift and/or bend their shoulders, elbows and arms (including hands and wrists) into uncomfortable positions to perform the job tasks on higher surfaces. For example, employees may have to raise their shoulders or move their elbows out from the side of their body to do a task on a high working surface. Also, they may have to bend their heads and necks to see the work they are doing.

Working surfaces that are too high usually affect the shoulders. The muscles must apply considerably more contraction force to raise and hold the shoulders and elbows out to the side, particularly if that position also must be maintained for more than a couple of seconds. The shoulder muscles fatigue quickly in this position.

On the other hand, when surfaces are too low, employees may have to bend their backs and necks to perform their tasks while hunched over the working surface. They may also have to reach down with their arms and shoulders to do the tasks. Where working surfaces are very low, employees may have to kneel or squat, which places very high forces on the knees to maintain the position and the weight of the body. Working surfaces that are too low usually affect the lower back and occasionally the neck.

As mentioned above, since muscles operate less efficiently in awkward positions, more force must be expended to do the task. Where employees work on high or low surfaces only occasionally (*e.g.*, once a week, only a short time each day), it does not pose a problem. However, where employees' primary working surface is too high or low, there is greater risk of injury due to exposure to awkward postures.

Examples:
- Threading extruded fiber onto a spool that is 15 inches above the floor, or
- Activating palm switches that are 60 inches above the floor.

Static postures. When awkward working positions must be maintained (*i.e.*, without support), it also increases the static

loading of muscles and tendons. This causes the body to fatigue even more quickly.

Examples:
- Working on a vertical drafting table, or
- Sitting at grinding bench where the grinding wheel is 24 inches above the floor.

Contact stress. There are two ways in which contact stress can occur when working surfaces are too high or low. The incorrect height can create contact points that would not exist if the surface was at the correct height. In addition, contact stress can occur when employees, whose arms and shoulders are fatigued from prolonged awkward and static postures, end up resting their forearms, wrists or hands on hard or sharp edges in order to rest their arms and shoulders.

Examples:
- Working at a computer placed on a folding table, or
- Holding an injection molded part at eye level by resting the elbows on the work surface.

Maintaining same work positions or posture for a long period. The chief complaint people usually make when they have worked for a long time in the same position is that they feel ''stiff, sore and tired.'' These are some of the effects that result when tasks involve static postures (*e.g.*, driving for several hours without a break).

Static postures increase the amount of force required to do a task because, in addition to the force required to perform the task, contraction forces must be applied to hold the body in position throughout the work shift. Maintaining the same position or posture includes a variety of things. It includes holding the arms and shoulders in a non-neutral posture without moving.

The effects of maintaining the same work positions can occur in almost any joint of the body and vary depending on body location. For example, the effect on the knees and back from squatting or kneeling for 2 hours is likely to be greater than the effect on the neck and shoulders from looking up at a monitor for the same period.

Static postures. Tasks requiring employees to maintain the same position for an extended period increase the static loads/forces on muscles and other tissues. The longer postures must be maintained, the greater the loading of muscles and other tissues. This increased force contributes to fatigue and muscle-tendon strain.

Exposure to contact stress may be a by-product of prolonged static loading. When muscles become fatigued, employees look for ways to rest the affected areas. Sometimes employees may rest their arms or wrists on the hard surface and edges of the workstation. For example, computer operators may relieve static loading on their forearms and wrists by resting their wrists on the edge of the computer table. However, the blood flow and movement of their wrists may continue to be reduced because of the contact stress.

Examples:
- Watching a computer monitor that is above eye level, or
- Holding a mouse that is located in front of the keyboard.

Awkward postures. The effects of static loading on the body are made worse where it is an awkward posture that must be maintained. Awkward postures add to the strain that muscles and tendons are already feeling because of static postures.

In addition, the fatigue that results from static loads may cause employees to assume awkward positions in order to rest fatigued areas. For example, employees assembling microchips and computer circuits may rest their elbows on the work surface in order to relieve static loading on arms, wrists and hands. However, leaning on the elbows to continue working may result in static loading of the back, shoulders, neck and contact stress on the cubital tunnel.

Examples:
- Cradling a phone on the shoulder, or
- Holding the arms on the top half of a steering wheel.

Cold temperatures. Exposure to cold temperatures exacerbates the effects of static postures because it too reduces blood flow to muscles and other tissues. This may interfere with the ability of muscles and other tissues to recover from the effects of static loading. Exposure to cold temperatures also causes reduction in manual dexterity and feeling.

Examples:
- A butcher working in the plant's cooler for several hours, or
- Standing to direct traffic on a busy road in the winter.

Sitting for a long time. Sitting for long periods without the opportunity to stand up and move around is another way in which employees are exposed to static loading of tissues, primarily in the lumbar area of the back. It can also affect the upper back, neck and legs. The problem is exacerbated where awkward postures are also present.

Static postures. Employees may be exposed to static postures when they must sit for a prolonged period on chairs, stools or benches that do not provide adequate lumbar support, that is, either the back rest of the seat does not provide good lumbar support or there is no back rest at all. When there is no lumbar support and the back is bent forward, the muscles of the back are trying to force the lumbar region out of it natural curve (*i.e.*, proper alignment of the vertebrae), which places pressure on the discs and reduces blood supply to the spinal tissue. The constant exertion of the contraction forces leads to muscle fatigue.

When the back muscles become sore, people tend to slouch. In this posture more force is being placed on the back and the discs. As the static loading continues, pressure continues to be applied to the membranes of the discs and they may become stressed. Stressed discs, in turn, may put pressure on blood vessels and may pinch a nerve (*e.g.*, sciatic nerve), which results in pain.

Even where the chair has a back rest with lumbar support to help maintain the back in a neutral position, employees still may continue to be exposed to static loading because they cannot take advantage of the back rest. This may occur when the seat pan is too big or the seat is too high for the employee. Many employees respond by sitting forward, instead of against the back rest, so that their feet can be on the ground, thus pressing the spine out of the natural curve and placing pressure on the discs.

Awkward postures. Employees are also exposed to awkward back postures when they are working in a seated position and the back is not in a neutral position. The awkward postures may be caused by the physical work activities employees perform while sitting, the level of fatigue, the characteristics of the seat, and/or the height of the working surface (and objects on the working surface).

The back is in an awkward position if the employee is leaning forward, slouching or slumping in their seats to work. Employees may lean forward because they are fatigued, because they must reach or lift an object, because the work surface is too low or not tilted, or because they

must move closer to see what they are working on. The awkward postures add to the static forces being applied to the discs and the muscles in the back. In addition, employees may be exposed to awkward neck postures when they look to see the work.

Examples:
- Working at a computer workstation where the operator must lean forward to see the screen,
- Working in a chair on an uneven floor.

Contact stress. Although contact stress that occurs from prolonged sitting is not directly related to the occurrence of MSDs, contact stress can increase discomfort and awkward postures. For example, where the seat pan is not padded at the edge, is too big or too high, it can create contact stress on the back of the thighs, which may result in constriction of blood flow to the legs. If employees sit forward to relieve this stress, the back is not supported and the employee may have a hard time maintaining the back in a neutral position.

Examples:
- Working in a chair where the seat pan is too long, or
- Working in chair with arm rests that are too close to the body.

Using hand and power tools. ''Using hand and power tools'' to perform physical work activities does not in itself mean that employees are exposed to ergonomic risk factors that put them at risk of injury. Rather, it is a shorthand way of alerting employers that there are aspects of tool design and use that need to be checked out to see whether ergonomic risk factors may be present. These include:

- Weight and size of tool,
- Tool handles and/or grips,
- Tool activation (repetitively, one finger),
- Tool kickback, vibration and maintenance.

Force. There are many ways in which operating hand and power tools can expose employees to high forces. First, when hand or power tools are heavy (*e.g.*, more than 10 pounds), employees may be exposed to high levels of force just to hold and control the tool. This is over and above the muscle force that must be applied to operate the tool and may cause the muscles to fatigue quickly.

Second, power tools that do not have good weight distribution can increase the force needed to operate the tools. This occurs when employees cannot hold tools at the ''center of gravity,'' and the tool rotates or spins around when it is in use. Employees must exert considerable muscle force and maintain the contraction forces to prevent such rotation.

Third, when tool handles or grips are too small or too big, employees must exert greater force to operate the tools because such handles/grips reduce grip capacity. Where handles are too narrow, employees may have to exert high muscle contraction forces to hold and operate the tool. For example, operating certain dental tools may require the exertion of considerable force and result in high pressure on the fingers and hand because they have very small handles (*i.e.*, narrower than a pen or pencil). And if the handles are too wide, there is less ability to generate the force (*i.e.*, muscle contraction) necessary to operate the tools, and employees are more likely to be exposed to awkward postures when they must bend or flex their wrists to maintain a grip on the tool handle.

Fourth, the way in which tools are activated can add considerably to the amount of force needed to operate the tool. Tools that have squeeze triggers may require employees to apply a lot of muscle contraction in the hands and fingers. Some triggers are so small that there is only room for them to be activated with one finger, that is, all the force to squeeze the trigger must be generated by one finger, which places excessive forces on the muscles and tendons of the finger. Because the fingers may not have enough strength to operate the squeeze trigger, the muscles may fatigue quickly. In addition, tendons may become so inflamed that fluid builds up in the area and it may be difficult to continue bending the fingers to squeeze the trigger. This is especially true for the use of manual hand tools, where exertion of a lot of force may be necessary to overcome the trigger's activation resistance.

Finally, application of high forces may be necessary to stop kickbacks and to resist the weight and power of some tools. For example, a logger or arborist may have to apply a lot force when cutting felled trees in order to prevent the kickback that could occur if the saw hits a very hard spot (*e.g.*, a knot in the tree). Employees using powered floor-buffers have to apply a lot of physical exertion to keep the buffers on a flat and centered plane and to keep them from spinning out.

Examples:
- Using powered driver to run and tighten nuts on bolts and opposing force when the driver reaches the end of the tightening process, or
- Constantly pressing the trigger to activate a drill with the index finger.

Awkward postures. There are several reasons why employees may be exposed to awkward postures when they are using hand and power tools. Awkward postures may be the result of bad tool design or workstation layout. Others may be poorly designed for the task so that the posture (awkward posture) requires more force and leads to overexertion of the fingers, hand, wrist, elbow, or shoulder (such as the use of a 90° screwdriver when an in-line screwdriver is more appropriate). A pistol grip electric drill may be fine on a vertical surface but on a horizontal surface the operator must turn the drill 90° to use it. Any force that must be maintained on the tool requires much more contraction of the muscles, which leads, in turn, to more rapid fatigue.

Examples:
- Reaching over a barrier to operate a rivet gun, or
- Squatting to tighten 20 bolts on a pipe flange.

Static postures. In many jobs the work situation requires that the worker constantly hold the tool and does not allow the worker to put the tool down. As a result, the grasp muscles and other support muscles are constantly active or statically loaded. Tools that require the worker to maintain some level of exertion to achieve a steady flow or activity such as a glue gun or a frosting bag require the muscles to be constantly in tension/contraction and applying some level of force. When workers have to hold a tool without putting it down, they must maintain the muscles in contraction. Mouse users who grip a mouse constantly because their work requires so much click and drag also experience these low but constant forces. Over time, fatigue of muscles and inflammation of tendons occurs.

Examples:
- Constantly holding knife used to trim chicken breasts in poultry plant,
- Holding a wire wrap gun.

Contact stress. Poor tool design is often the cause of contact stress in the use of operating tools. For example, gripping handles that are small may press the handle or handle edge into the skin, resulting in contact stress. Knurls (indentations in handles) may result in contact stress if they push into the fingers because they do not fit the operator's hand.

Examples:
- Using a screwdriver with edges on the handle to tighten bolts on an assembly line,
- Using a small wire clippers (handles press into the palm) to remove component lead after wave solder.

Vibration. Although using powered hand tools (*e.g.*, electric, hydraulic, pneumatic) may help to reduce risk factors such as force and repetition, they can expose employees to vibration. Vibrating hand tools transmit vibrations to the operator and, depending on the level of the vibration and duration, may contribute to the occurrence of Raynaud's phenomenon (*i.e.* vibration-induced white-finger MSDs) (Ex. 26–2). Vibration inhibits the blood supply to the hand and fingers, which leads to numbness and tingling in the fingers. These vibration-induced MSDs show a progression of symptoms beginning with occasional or intermittent numbness or loss of color (*i.e.*, blanching) in the tips of a few fingers. Continued exposure leads to more persistent attacks, affecting greater parts of most fingers and reducing feeling (*i.e.*, tactile discrimination) and manual dexterity (Ex. 26–2) (see the Health Effects section for a more-detailed discussion of specific MSDs).

The level of vibration can be the result of bad design, poor maintenance, and age of the powered hand tool. For example, even new powered hand tools can expose employees to excessive vibration if it they do not include any devices to dampen the vibration or in other ways shield the operator from it. Using vibrating hand tools can also contribute to muscle-tendon stress and fatigue. Operators may have to use increased grip force to steady such hand tools.

Examples:
- Cutting trees with chain saw, or
- Using grinding tools to form dentures.

Cold temperatures. The effects of any or all of the risk factors discussed can be exacerbated if the employee is exposed to cold while operating the tool. The cold temperatures can be due to the workplace environment (*e.g.*, deboning meat when temperatures must be maintained below certain levels, using a chain saw in the winter) or due to air blowing from the power tool across the operator's hand. When cold air blows across the hands, the fingers get cold and they are less dextrous. The reduction in dexterity occurs because blood flow is reduced in the cold fingers, blood flow becomes constricted, and the tissue becomes stiff.

Examples:
- Using a knife to process catfish fillets,
- Using a socket wrench to change out equipment on the roof in the winter.

Vibrating working surfaces, machinery or vehicles. Most jobs that involve contact with vibrating surfaces, machines and vehicles are easy to see, hear or feel. Since many products and processes are disturbed by vibration, employers often isolate and dampen vibration to levels below the threshold of effect on workers. However, there are some processes for which vibrating surfaces are unavoidable. An employee who comes into contact with such a surface may absorb enough vibration energy to create a health concern. Exposure to vibration energy usually results in one of two types of exposure—whole body vibration and hand/arm vibration. The exposures can result in an increase in forceful exertions, fatigue, numbness, tingling, and a loss of dexterity. These results are exacerbated by the presence of a cold environment.

Work conditions that involve sitting, standing or lying on a vibrating surface produce whole-body vibration. Excessive levels of whole-body vibration or exposure to it for prolonged periods can make it difficult to perform job tasks due to numbness and tingling and a loss of dexterity. Vibration energy can disrupt blood flow and affect the nervous system. Body parts that absorb the vibration (like the back and knees) are particularly vulnerable. Workers who stand on vibrating surfaces absorb most of the vibration energy in their legs, particularly the knees. Whole body vibration forces on the spinal discs can cause microfractures in the disc structure, which may lead to herniated or ruptured discs. Vibration can also disrupt the blood supply to the tissue around the spine, resulting in fatigue and inflammation. When the feet or buttocks are in contact with a vibrating surface, injury is usually to the spine.

Examples:
- Working near a 100-ton press,
- Working near a vibratory bowl, or
- Operating a fork truck over rough dock plates or gravel.

When the hands are in contact with a vibrating surface, the energy is primarily absorbed in the hands and arms and may lead to hand-arm vibration illnesses. The most common sources of hand-arm vibration syndrome are vibrating hand tools (*e.g.*, chainsaws, rivet guns, back pack leaf blowers). Some more subtle sources are holding pressurized hoses with nozzles, using a striking device such as a hammer, resting the hand on a vibrating machine, and holding a handle such as a steering wheel attached to a larger piece of equipment. In addition to the damage that is caused by the vibration energy, the muscles can become fatigued and strained due to the additional forces needed to compensate for the lack of tactile feedback and dexterity caused by the vibration. These losses are a result of the disruption of the peripheral sensory nerves caused by vibration. When the hands are in contact with a vibrating surface, injury is usually to the hands and arms.

Examples:
- Leaning against a grinding machine while it is operating,
- Holding a wheel while operating a sewing machine, or
- Manually aligning sections of a newspaper using a vibrating table.

Cold temperatures. Vibration reduces blood flow to the affected tissues. Vibration has a synergistic effect on the loss of blood flow in the presence of cold temperatures. The effect is present in the extremities because the body reacts to cold temperatures by shunting blood away from the extremities to preserve body heat.

Examples:
- Driving a fork truck over rough surfaces in a frozen food warehouse, or
- Using vibrating etching tools in a clean room

Workstation edges or objects press hard into tissues or joints. In some workplaces there are sharp edges or corners that press into the workers' skin during the course of their job. Workers who, because of the job and workstation design, must rest their arms or lean against a table with a